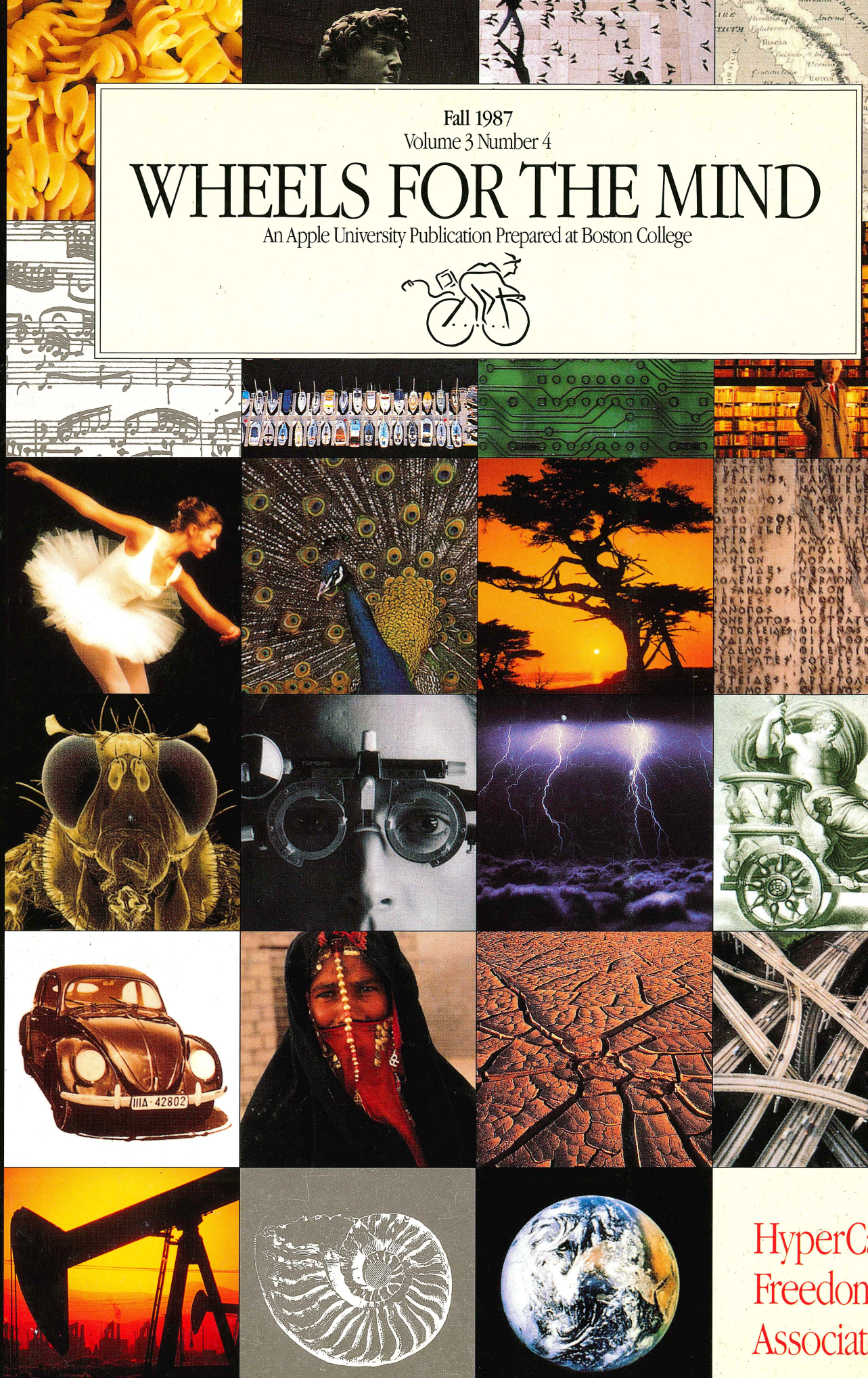
Fall 1987
Volume 3 Number 4

WHEELS FOR THE MIND

An Apple University Publication Prepared at Boston College



HyperCard: Freedom to Associate

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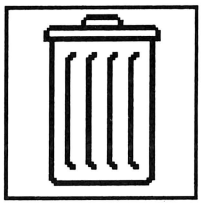
WHEELS FOR THE MIND

Editorial



Welcome to the Fall 1987 issue of *Wheels for the Mind.* Our thanks go out to the many readers who have already sent in the survey that was included in the last issue. If you haven't returned yours yet, please do so. Your opinions count.

We are now in the process of planning an issue on courseware, authoring systems, and videodisc applications. If you are working on a project in any of these areas, or have related information that might be helpful to our readers, please drop us a note.

In addition, we would like to keep track of what HyperCard stacks are being developed by students, faculty, staff, developers, and Macintosh enthusiasts. So, if you have any "Stackware," let us know.

There are lots of exciting things coming up. Please help us along by sharing your projects and ideas with other *Wheels for the Mind* readers. Remember, the more you participate, the greater this network becomes.

As usual, if you wish to send along an article, project status report, or other submission, forward it to:

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Take care.

Wheels for the Mind

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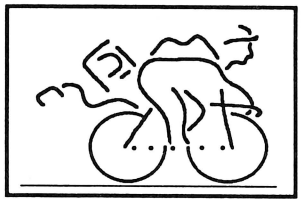

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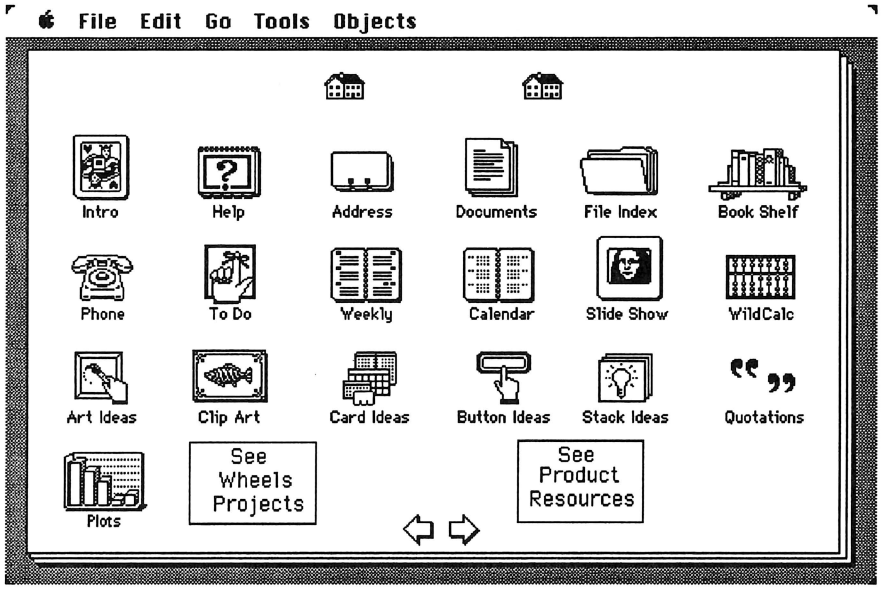
Focus

This issue's **Focus** section will concentrate on one of the most exciting developments in personal computing since the Macintosh user interface: HyperCard™, Apple's personal toolkit for the Macintosh™ personal computer.

HyperCard: How One Good Idea Can Lead to Another

Someday, you may be able to look through publications like *Wheels for the Mind* simply by pressing a button on your Macintosh screen. For example, consider the screen shown below.

Someday, you may be able to scan* Wheels *simply by pressing a button on your Macintosh screen.



Imagine pressing the button labeled "See Wheels Projects," entering the particular area in which you're interested, and having the descriptions of the projects in that area come to the screen automatically. But that's not all. What if you could stop during your reading of one of the projects and actually try it out? Or wouldn't it be nice to finish reading about a project and then be able to see a video replay of a teacher testing that project in the classroom?

HyperCard is the brainchild of Apple Fellow Bill Atkinson.

Well, all of these things are now possible, with Apple Computer's new HyperCard software. HyperCard is the brainchild of Apple Fellow Bill Atkinson, the developer of MacPaint® (and many other things). His dream was to put the power of the microcomputer into everyone's hands; it took him three years to create HyperCard.

When the Macintosh was introduced, users marveled at the simplicity of its unique user interface. But learning to program this new machine was difficult, to say the least. So, ever since, people have sought a programming/applications development environment as simple to work with as the Macintosh interface itself. After all, there are a lot of people with creative and potentially useful ideas—people who can't afford to spend the time that it takes to become an accomplished Macintosh programmer.

It lets you organize information in much the same way as you do in your mind—by association and context.

HyperCard may not turn everyone into an expert programmer overnight, but it *does* put some very powerful programming tools into the hands of the user. It lets you organize information in much the same way as you do in your mind—by association and context—using as a metaphor the index card. Starting from this simple image, HyperCard allows you to access information stored using virtually any type of media, including video, animation, and sound.

The collections of *index cards* that appear on the screen are commonly referred to as *stacks*. In the coming months, an increasing number of commercial and noncommercial applications based on HyperCard will become available. Such applications are referred to as *Stackware*™.

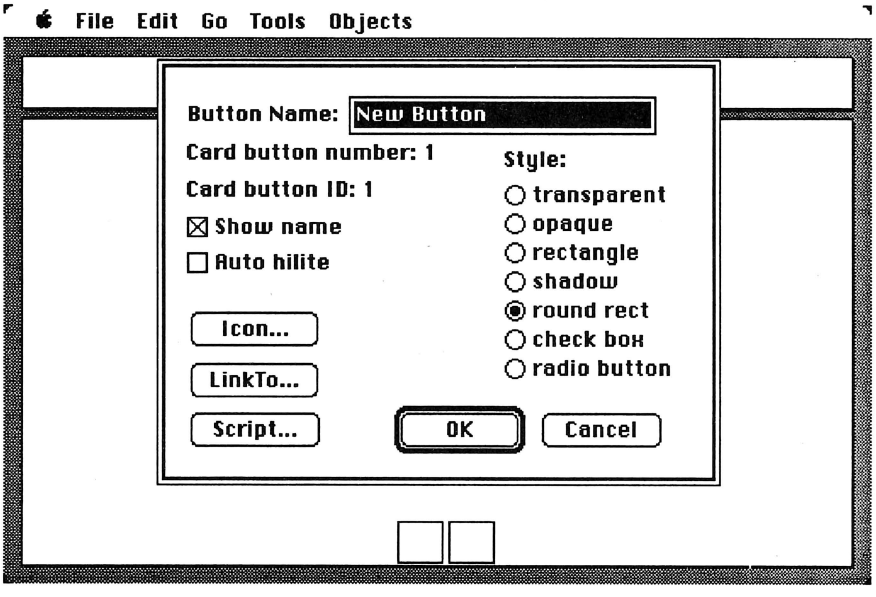
How It Works

You can create a button to do almost anything your Macintosh can do.

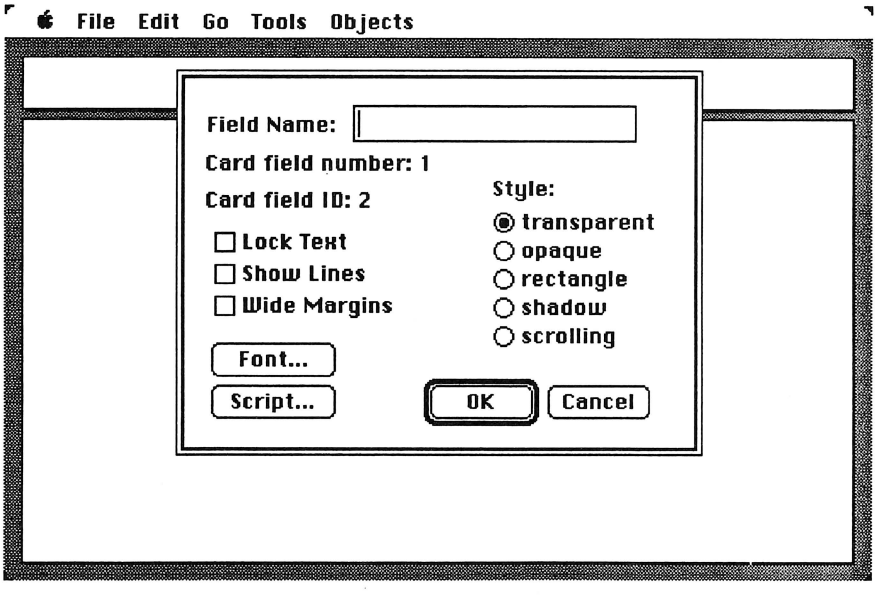
Any card that is in a stack can contain *buttons* and *fields*. Buttons perform a variety of tasks. They can send you to another card, send you to another stack, play music, make invisible fields visible, activate spoken text, launch a Macintosh application, dial a telephone, link one card to another, print a report, operate a videodisc player, and much, much more. They can also be customized to suit your needs. In fact, if you work at it, you can create a button to do almost anything that your Macintosh can do.

Buttons can even be cut and pasted from one card (or stack) to another. So once you've defined exactly what you want a button to do, you can paste that button into other applications.

The figure below illustrates the many features that are associated with buttons. Notice, for example, that buttons can be transparent. This means that you could place a button behind a figure—or behind one of the answers to a multiple-choice question—and have a particular task performed when that button was pressed.



Fields also have many qualities associated with them. They can contain text in a variety of fonts and styles, execute a formula (like a spreadsheet cell), and be visible or invisible.



HyperTalk

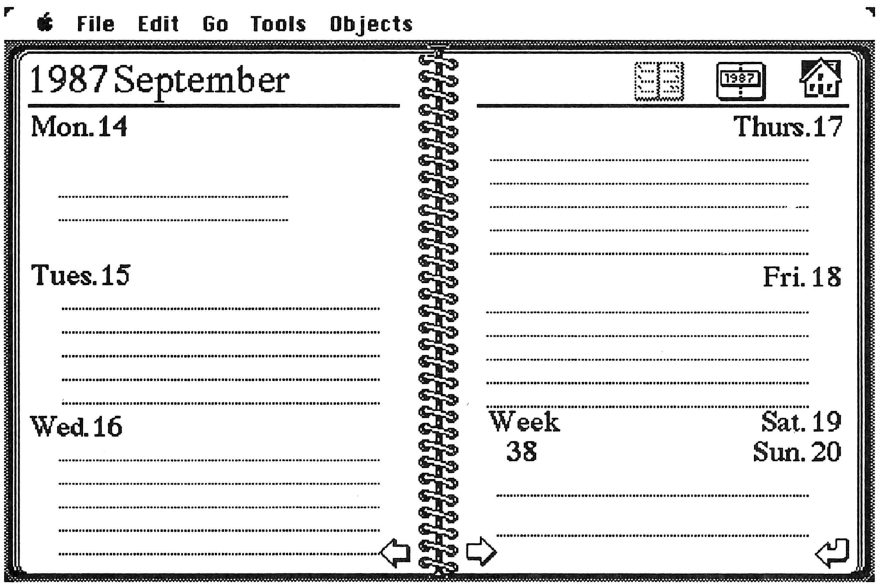
HyperCard is based on a very powerful language called HyperTalk.

Wait! There's more. HyperCard is based on a very powerful language called HyperTalk. Users don't have to know this language to build HyperCard applications, because many of the design features are built right into menus. But if you want to get a little more elaborate, you can use HyperTalk to write scripts that are activated when certain Macintosh events occur. *(Perhaps you have heard of the term* event trapping. *This is the ability to detect a Macintosh event, such as a mouse click, the mouse button being held down, a field being closed, or a card being opened. HyperTalk gives you a very powerful set of procedures for event trapping.)* In fact, you can use HyperTalk to design applications that operate a videodisc player, connect to on-line data services, and access CD-ROM drives.

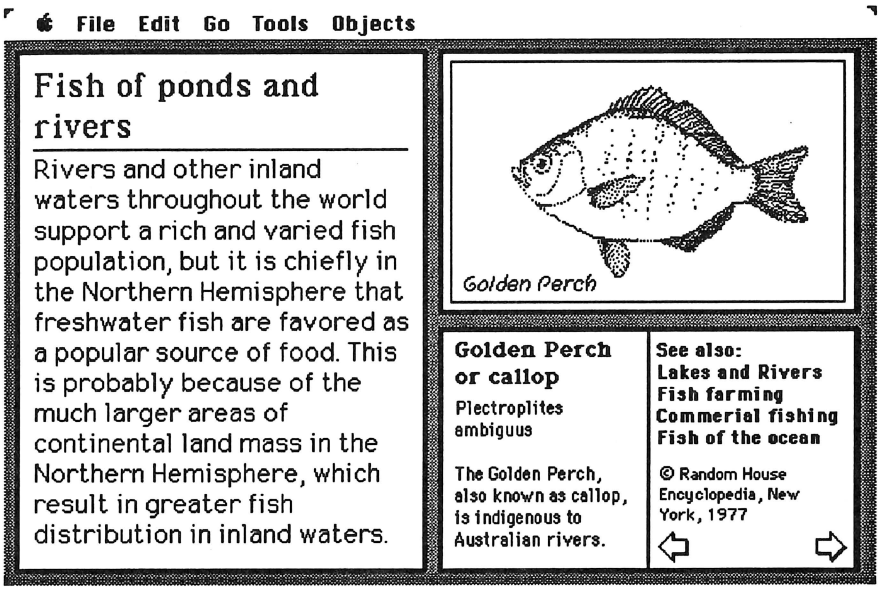
Examples of HyperCard Use

You can work with HyperCard in four ways:

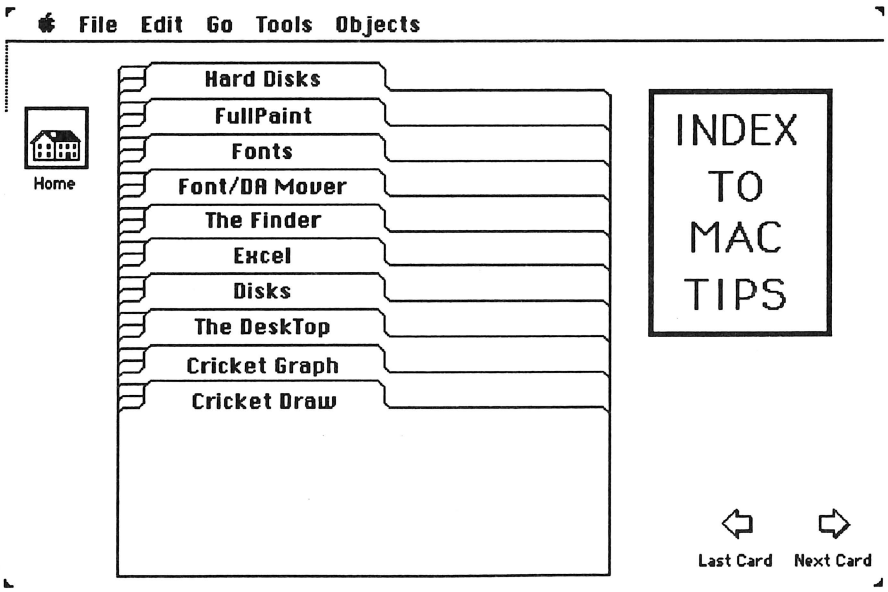
- **Using a template:** At the simplest level, you can take stack templates that were designed by others and fill them in with information that is relevant to you. The next figure illustrates a use that falls into this category.



- **Accessing an information-rich template designed by someone else:** The second way to work with HyperCard is to purchase a stack of information and browse through it to find materials of interest to you; for example, Grolier's *Academic American Encyclopedia* is currently on a CD-ROM and will soon be accessible via a HyperCard stack.



One could envision a stack of clip art, a stack of Macintosh tips and techniques, and so forth. The next two figures illustrate these ideas. However, these static pictures can't do justice to the dynamic ways in which users can interact with a stack.



File Edit Go Tools Objects

Area/Product: MacWrite

Title/Heading: Double Underlines

Tip or Technique

Double lines can be created in MacWrite by choosing underline from the Style menu and then typing with the underscore character (Shift -hyphen). To get the "double line" under words, you must enter a double line for a few spaces, then begin typing your words, and then end with your double lines again. This feature does not work on the LaserWriter printer yet.

Home

Make a Note

Return to Index

Also..

Last Card

Next Card

Information does not have to be voluminous in order to be referenced by using HyperCard. For example, someone might create a stack that teaches all about using the library, or how to fix a bike, or how to write a term paper, and so on. You click on a field of interest, and the library call numbers for that field "pop up" in a window on that card.

HyperCard can also be used to design courseware.

HyperCard can also be used to design courseware. It is possible, for example, to design a stack in which each card has a question on it, followed by three or four possible answers. When you press the mouse button down to choose a particular answer, the application branches somewhere else (for example, to another card, a videodisc clip, or a picture). The course designer can also have one of the cards in the stack act as a grader, keeping track of users' progress. A button could even be designed that printed a summary of each user's experience at the end of a session.

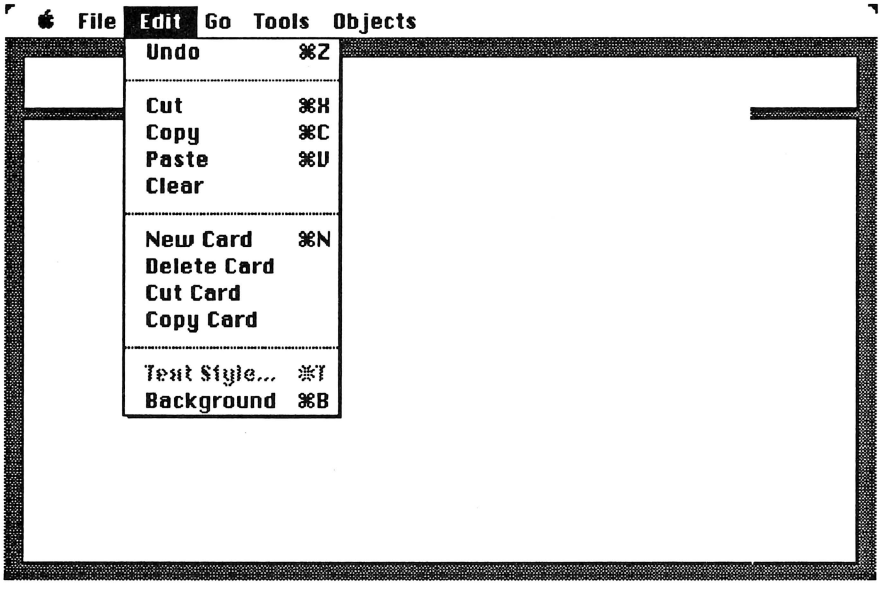
- **Creating your own stacks:** People without special training in programming can create fully functional HyperCard applications. The best way to illustrate the process is to take you through it graphically.

Suppose that you wanted to create a stack of cards that contained information about people in your department. You might want the basic card to contain fields for entering biographical data. Then, you might wish to have buttons on the card that, when pressed, would give you more detailed information about that person (for example, a list of the projects that he or she is working on). Here is the process that you might use to create your stack. Remember, no programming experience is necessary; all of the following is accomplished through the use of menus.

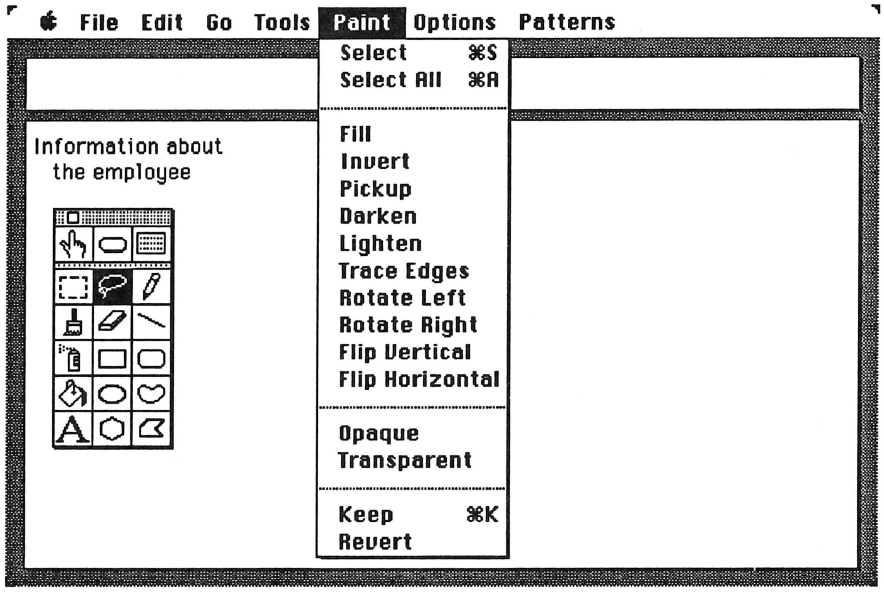
Suppose that you wanted to create a stack of cards that contained information about people in your department.

1. The first thing you would need to do is to select a background design for each of the cards in your stack. This could be done in MacPaint or some other drawing program and then imported into HyperCard. You could also design the background directly within HyperCard, because one of its menus contains a "superset" of MacPaint.

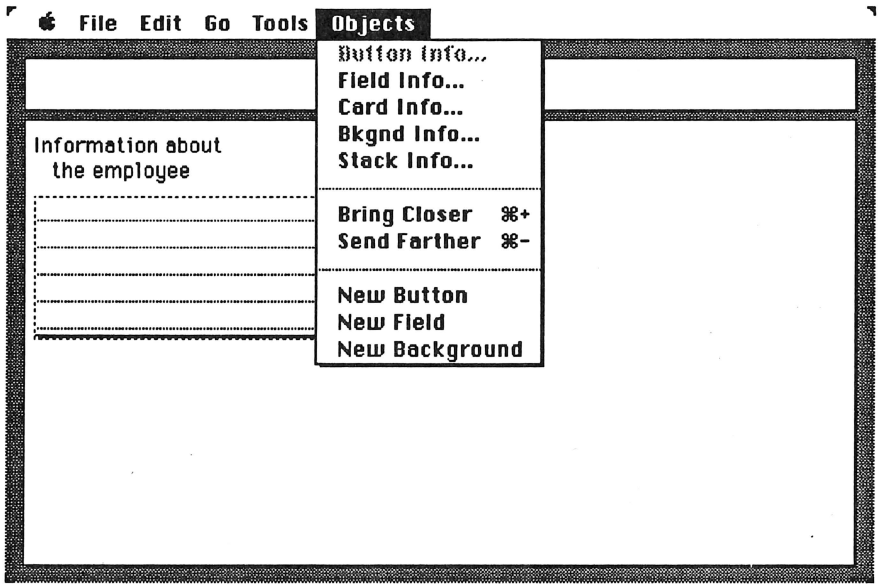
Create a sample background.



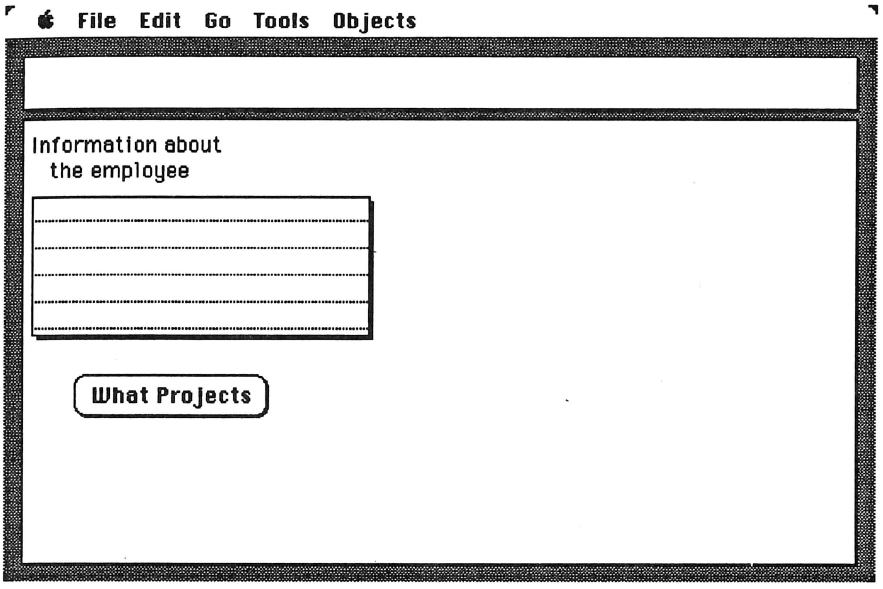
2. Customize it with the program's MacPaint-like tools.



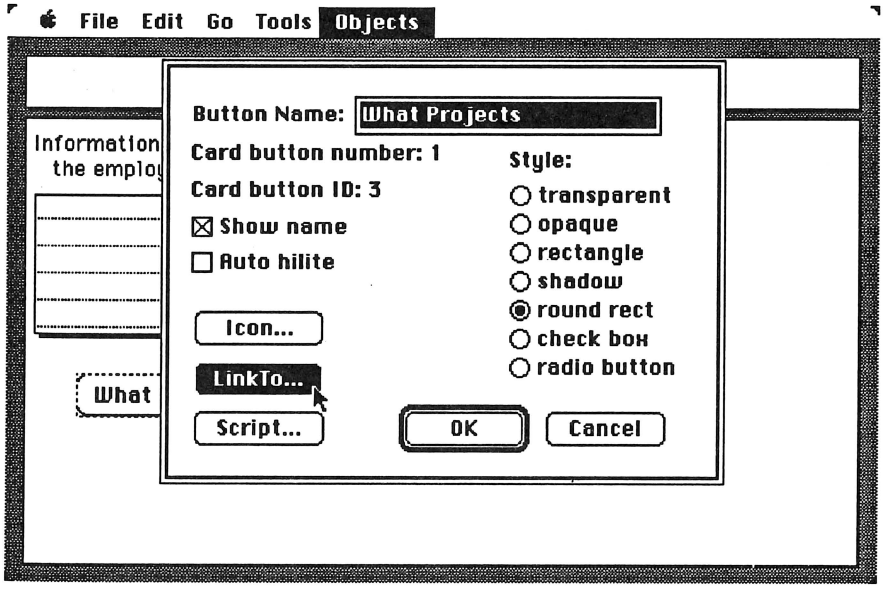
3. Add a field to the card.



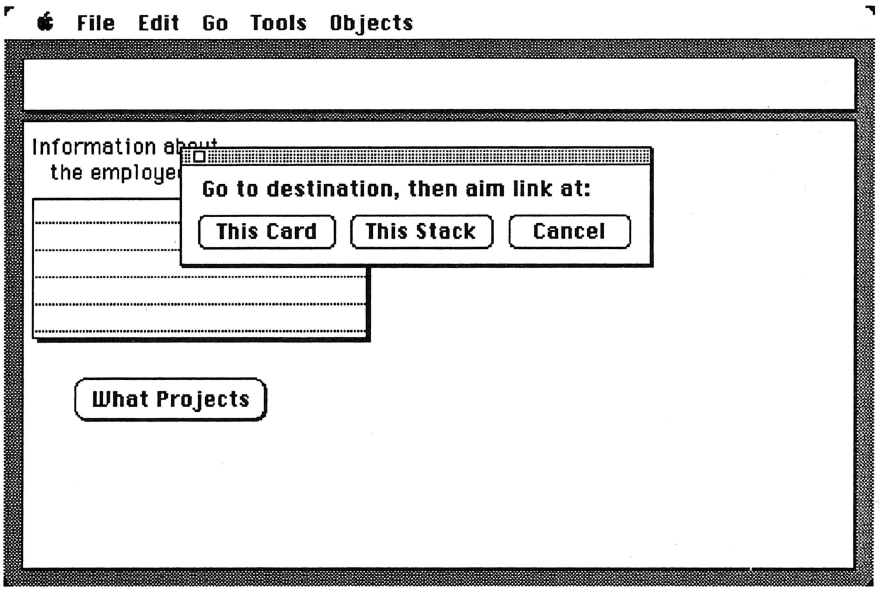
4. Add a button to the card.



5. Customize the look and feel of the button.

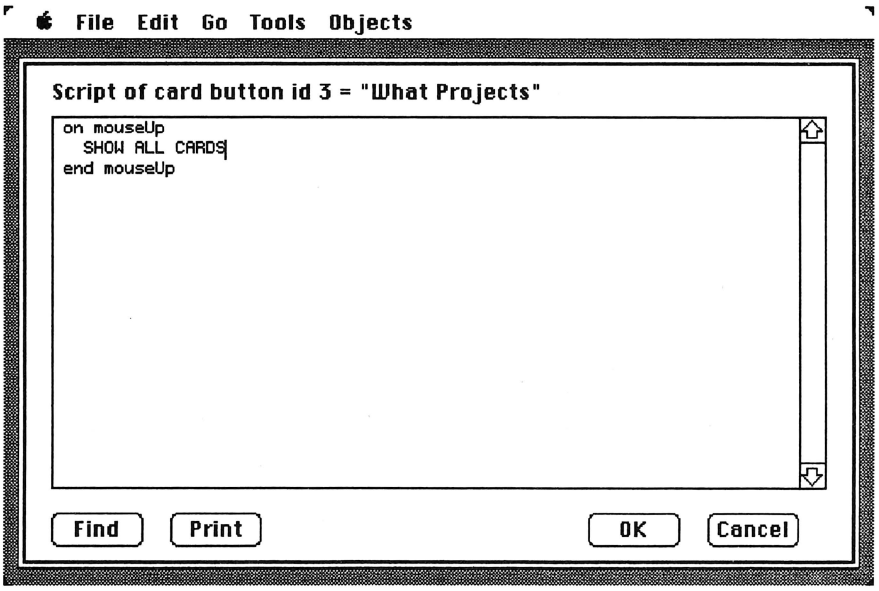


6. Link the button to another card by pressing the Link To button in the dialog box shown. You would then be asked to bring to the screen the card you want to link to when this button is pressed. After you do this, HyperCard "writes the code" (the script) that will be activated by that button.



You now have the beginnings of a working HyperCard stack.

- **Programming in HyperTalk:** If you wish, you can use HyperTalk to create very sophisticated scripts. The language is Pascal-like, with a distinct flavor of English. The next figure illustrates a script that you might write that causes all of the cards in a stack to be shown on the screen, one after another, when the button is pressed.



HyperTalk contains procedures for trapping most of the Macintosh events, many built-in functions, if statements, loops, commands to activate and use menus, and much, much more. The language even allows you to add your own commands.

It is clear that HyperCard is going to have a major impact on the Macintosh user community. It should unleash the power of this machine, so that many talented and creative people can begin to develop ways in which to share their ideas, knowledge, and dreams with others. Look for great stacks to begin to appear on the scene.

It is clear that HyperCard is going to have a major impact on the Macintosh community.

Some HyperCard Facts

To use HyperCard, you must have a Macintosh Plus, Macintosh SE, or Macintosh II with at least 1 megabyte of memory (2 megabytes would be better), two floppy-disk drives or a hard disk (a hard disk is preferred), System version 3.2 or above, Finder version 5.3 or above, ImageWriter® version 2.6 or above, and LaserWriter® version 4.0 or above.

The number of stacks, or cards in a stack, that you can have is limited only by available storage. The maximum stack size is 4,096 megabytes (yes, megabytes!).

The size of a HyperCard card is limited to the size of a Macintosh Plus screen (regardless of which machine or devices you may be using); however, you can add scrolling ability to a card, which lets it store more text than is visible on a single screen.

You can have an unlimited number of text fields on a card, but the amount of text per field is limited to 32,767 characters.

There is no limit on the number of buttons or links that you may associate with a particular card.

HyperCard Book Available Now

Bantam Books has just published *The Complete HyperCard Handbook* (720 pages/ $29.95). It was written by Danny Goodman and is a very thorough treatment of the features of both HyperCard and the HyperTalk language. Since the manual that's shipped with the product contains very little on the HyperTalk language, this text is a must for users who are planning to develop serious applications. For further information, or to order, contact: Bantam Books, Inc., Dept. HP, 666 Fifth Avenue, New York, NY 10103.

HyperCard Project Ideas

Dr. Peter Olivieri is teaching a course on HyperCard at Boston College this semester. As part of the course requirements, students will have to build actual HyperCard applications. At the beginning of the term, students proposed the following project ideas:

- Develop an application that could be used by a coaching staff to help train a quarterback to recognize defensive formations.
- Develop an application that the university could use to keep track of several hundred keys.
- Develop an application that could be used to teach student nurses about the proper ways to administer intravenous medications.
- Develop an application that could be used by the library to orient visitors to its facilities.

A "generic multiple-choice test."

- Develop a "generic multiple choice test"; a faculty member could enter questions and answers on a screen, and the application would present the test and keep track of a respondent's score.
- Develop an application that visitors/students could use to find their way around campus; "kiosks" could be placed in various locations.
- Develop several short videodisc-based applications that could demonstrate the instructional use of an interactive videodisc.
- Develop an application that could keep track of a student's academic record.

An application to keep track of the placement of pitches during a baseball game.

- Develop an application that could be used by a professional baseball team to keep track of the precise placement of pitches by each pitcher (to be used live during games).
- Develop an application that would keep track of which "groupings" of players on a basketball game perform better.
- Develop an application for the audiovisual department that would keep track of the equipment available for use throughout the university.
- Develop an application that would guide students through the correct process of writing a paper (from outline to bibliography).
- Develop an application that would be a "Guide to Campus Student Activities."
- Develop an application that would teach users (by example) the appropriate ways in which to give a presentation.

- Develop a "Fact File" that contains hundreds of facts and figures of use to students (for example, metric conversions, simple interest, time zones, and area codes).
- Develop an application that would teach users how to get to some of the major places in Boston.
- Develop an application that could be used to demonstrate the effective use of technology in teaching (perhaps with a video component).
- Develop an application that would teach users how to approach making investments.
- Develop an application that could be used in place of the university information services directory.
- Develop an application that presents digitized biographical information about all full-time faculty members.
- Develop an application that contains term paper and project ideas for four or five disciplines.
- Develop an application that would act as a reference guide to the major statistics formulas.
- Develop an application that would be a student guide to studying (tips on memorizing, note taking, and so forth).
- Develop a guide to the top three reference books in every discipline.
- Develop a "Wheel of Fortune" game (less Vanna White).
- Use HyperCard to administer an IQ test.
- Develop an application that would allow a user to keep track of the frame numbers of different segments of video on a videodisc.
- Develop an application that would keep track of vital financial information on the Fortune 500 companies.
- Develop an application that would give students an idea of what was involved in a particular major field of study (prerequisites, requirements, electives, job opportunities, career paths, salaries).
- Develop a quick-reference guide to anatomy and physiology.

An application that would teach users how to approach making investments.

A "Wheel of Fortune" game (less Vanna White).

An application that contains all of the Wheels *Project Reports.*

- Develop an application that contains all of the *Wheels for the Mind* Project Reports.
- Develop a generic application that administers a survey, summarizes the results, and plots the answers to selected questions.
- Develop a "time capsule" application for a particular year (facts, figures, major events, scanned graphics, and so forth).
- Develop an application that could be used by the housing office at Boston College to keep track of room assignments, room conditions, inventories, and other related details.

HyperCard Stackware Projects

There are several categories of HyperCard applications:

- Stand-alone applications
- Applications that interface with a videodisc
- Applications that interface with a CD-ROM
- Applications that interface with an on-line database

Future issues will provide more complete listings.

Here is a very brief listing of some of the projects currently in progress. For now, contact names and phone numbers are not given. In future issues of *Wheels for the Mind,* more complete listings—including contact information—will be provided.

Stand-Alone Applications

- **Harvard and Boston Universities (Massachusetts)**

Perseus Project: An interactive tool to aid in study of and research on Ancient Greek civilization, including literature, history, religion, and art. English translations of famous Greek texts, including commentary. Plans call for later connection to optical media (videodisc or CD-ROM).

- **Activision (California)**

An electronic atlas and travel planner.

Business Class: An electronic atlas and travel planner for businesspeople, including maps and facts for 60 countries; converters for time, currency, and temperature; and an itinerary maker. To be released soon. (Two disks: $69.95)

HyperDesk: Desk organizer, integrating calendar, to-do list, phone log cards, and forms management. Also known as Focal Point. To be released soon. (One disk: $99.95)

- **Xiphias (California)**

Time Table series: A series of stacks to show major historical dates and evolution in various subjects, including science and innovation, government and politics, sports, religion, consumer daily life, and more. Includes text and graphics, with hypertext links via keywords. The first disk (Broadcast and Computing) was released at the beginning of September and will become part of a five-disk set called Science and Innovation. Future plans call for the series components to include sound and to be assembled on a CD-ROM.

- **Saving Zone (Washington state)**

A tool that helps users select desktop publishing software.

Zone Club Disk 2: A tool that uses the hypertext capabilities of HyperCard to help users select desktop publishing software. Includes descriptions and screen dumps of products, to communicate their exact "look and feel" to potential users. To be released in November.

- **Farallon Computing Inc. (California)**

PhoneNET Manager: A network-management system that works with Farallon Computing's PhoneNET StarController. Shows interlinked maps of the network, including building locations, Macintosh computers, printers, controllers, ports, and bridges. Pie charts display data circulation between users. External functions added to HyperTalk allow users to control and reconfigure the network. Should be available at the end of the year.

- **Int'l Educational Consultants (Pennsylvania)**

How to Set Up a Workstation: Industrial training. Small stack. No release planned yet. Internal tool for the company.

- **Boston College (Massachusetts)**

Stacks to help with student registration and orientation.

The Student Adviser: Stacks to help with student registration, to show how to search the college library, and to help new students (and professors) find their way around the campus. Stacks with tips and techniques for using Macintosh and its software (MacWrite, Microsoft Word and Excel, and more). Stack of HyperTalk scripts.

If you have any educational Stackware, Peter Olivieri (AppleLink address: A0130) is interested in hearing about it—and would like to mention it in the next issue of Wheels for the Mind.

- **Cornell University (New York)**

Language Learning Series

- **Apple Cupertino (California)**

A HyperCard version of* Inside Macintosh, *the "programmers' bible."

Inside Macintosh: The "programmers' bible" is being made available on stacks, with links between concepts, hooks to annotations, and pieces of code ready to copy and paste. The product will be published through Addison-Wesley.

Boston Kiosk: At Macworld℠, visitors could find their way around the showroom using a HyperCard application that featured maps and indexes of products and exhibitors.

Macintosh SE: Technical training on the different parts of the computer (chips, monitor, keyboard).

MegaCorp: A presentation explaining the company to new employees, including organization charts, a map of the buildings, an employee directory, a copy of the annual report, and more.

SQL interface: Draft of a HyperCard/SQL interface that would create a HyperCard stack from an SQL table (and vice versa) and allow a user to send a query from HyperCard to an SQL database on a minicomputer or mainframe.

So Far: Apple history with digitized pictures and sounds (a 6-megabyte stack!).

HyperCard Applications That Interface with a Videodisc

• Voyager Company (California)

Laserstacks or Laserguides (stacks of cards that control a videodisc player), and Lasercables (cables that connect a Macintosh and any of the following videodisc players: Pioneer LDV4200 and LDV6000, Sony 1000A, 1500, 2000, Panasonic TQ2024F, Philips model) are now trademarks of Voyager Company. Voyager already publishes about 35 videodiscs, and will provide HyperCard stackware with the following titles by the end of 1987. (All of the videodiscs, which are in NTSC format, are already available.)

—The National Gallery of Art: Contains the entire permanent collection of paintings on display at the museum in Washington, D.C. The user can ask to be shown all paintings by Renoir, all impressionist landscapes, all still lifes with apples, all 18th century group scenes, and so on. Virtually any combination can be entered via the program's message box. Will ship September 30. (Stacks: $49.95; videodisc: $95)

—The Vancouver Disc: Stacks developed by Interaxis, a seed site in Canada.(Videodisc: $59.95) (Voyager plans videodiscs about other cities of the world.)

—Van Gogh: Includes 500 paintings. (Stacks: $39.95; videodisc: $49.95)

—Apollo 17: The Last Apollo moon mission. (Stacks: $39.95; videodisc: $39.95)

—Bio-Sci: Visual library on biology, including 6,000 photos. (Stacks: $199.95)

• Stanford University (California)

Steinbeck project: Multimedia teaching and learning tool covering *The Grapes of Wrath*. Links the novel with its historical context (economics, politics, arts), particularly its relationship to the New Deal. Reproduces, with the help of a multimedia environment that includes sound and motion pictures, some of the scenes in the book.

Shakespeare project: The user becomes the director of the performance, changing the stage and the cast. A performance with famous actors is stored on videodisc; the Macintosh simultaneously displays the dialog and the actors' thoughts.

• University of Utah

Med-Videodisc Manager: To teach medical students neurosurgery. (Described in detail following this section.)

Shuttle views, volcanic eruptions, tornadoes, and thunder—all at a click of the mouse.

• **Optical Data (New Jersey)**

LaserCards (a stack of cards with control of a videodisc player) is now a trademark of Optical Data. The company supports the following NTSC players: Pioneer LDV4200 and LDV6000, Hitachi 9500, Panasonic TQ2024F, Sony 1500. The following videodiscs (already on the market, except for Physical Science) will be "paired" with stacks:

—Earth Science: Geology and meteorology (shuttle views, volcanic eruptions, tornadoes, and thunder—all at a click of the mouse). (Stacks: $39.95; videodisc: $400)

—Life Science: Surveys human biology, cell biology, and the major groups of organisms through narrated video clips, a thousand photographs, hundreds of diagrams, glossary terms, and lab slides. (Stacks: $39.95; two videodiscs: $400 each)

—Physical Science: Matter, forces, motion, waves, electricity, and magnetism. (Stacks: $39.95; two videodiscs: $400 each)

• **Point Foundation (California)**

Whole Earth Catalog: Partial adaptation of a printed mail-order catalog.

• **WorldView Communications (California)**

WorldView: An electronic atlas with maps, texts, slides, video clips, and music.

An interactive tutorial on the origins and use of the Constitution.

The U.S. Constitution: An interactive tutorial on the origins and use of the Constitution, with maps and historic film clips.

• **Walt Disney Computer Software (California)**

Donald in MagicLand: Interactive educational game.

• **WGBH (Massachusetts)**

Interactive Nova: Multimedia television (MTV) project to turn TV and video production from "insensitive download" to active user control via computer.

HyperCard Applications That Interface with CD-ROM

• **Grolier Electronic Publishing (New York)**

Academic American Encyclopedia: Grolier announced a research collaboration with Apple to develop a multimedia prototype of its encyclopedia, which is already available on CD-ROM, using HyperCard to integrate text, visuals, and audio on the Macintosh.

- **Arthur Young & Company (California)**

In-house information management (not for public release): Two stacks developed internally: calendar tracking expenses and creating time sheets; financial and client database (will be stored on a CD-ROM).

HyperCard Applications That Interface with On-Line Data Bases

- **Dialog (California)**

Information Access: Three databases available through HyperCard. Text is sent through phone lines, then imported into HyperCard fields for display and manipulation. Allows users to search a newspaper directory by topic, to find the full text of the article, and then to gain statistics on the company that was the subject of the article.

- **Apple Cupertino**

AIDSNet: Network that allows doctors and research centers to exchange information about AIDS and to update the same database.

A HyperCard Application: MED-Videodisc Manager

Program written by Dr. Prasad Kaipa and John Macfarlane
University of Utah

The MED-videodisc manager was designed for the Department of Neurosurgery at the University of Utah School of Medicine to teach medical students neurosurgery through lectures, questions, graphics, and videodisc images.

The MED-videodisc manager helps teach medical students neurosurgery through lectures, questions, graphics, and videodisc images.

IBM SMART contained a 12,000-record database describing a 12,000-image videodisc called "The Slice of Life." These records were converted by the Write command in SMART into ASCII code. This code was then stored on an IBM floppy disk and, from there, transferred via MacCharlie onto a Macintosh disk. The IBM SMART Write command caused each field to be delimited by a comma, but in Macintosh, fields should be tab-delimited. To handle this discrepancy, the ASCII file was manipulated in Microsoft Word to change the commas to tabs.

The HyperCard database was set up with the same number of fields as the original IBM SMART database. The database fields had to be set up as background fields, and, obviously, these destination fields needed to be numbered in the same order as the source fields. Once the delimitations were set and the fields were created, the ASCII file was imported through the Import Text button into the MED-videodisc manager HyperCard stack.

Because this database describes a videodisc, the file had to be linked to the HyperTalk video controller. We choose the Hitachi 9500 videodisc player because of its availability, ease of interface, price, and reputation for service. This player is easily connected using a standard Macintosh RS-232 interface.

Each card in the stack featured buttons set into the background to allow the student to use the stack efficiently, skipping cards and images as desired. These management capabilities included a command to leaf quickly through the cards, a command to return to the home card, and Previous and Next buttons.

One card in the stack contains a lecture on brain tumors.

One card in the stack contains a lecture on brain tumors. Its text is linked with buttons to video images, spreadsheets, and graphics. As the student studies the card, these graphic aids to understanding can be displayed.

In order to test medical students' understanding of the lecture that they have just studied, cards containing questions were set up and linked to video images, video segments, spreadsheets, and graphics. The format for these questions is multiple choice, and each answer is equipped with a button that triggers a display of congratulations or an admonition to try again. The answers have also been linked to video images to demonstrate the rationale behind the response.

Clinical management problems can be entered into a card, along with diagnoses, lab data, and treatment plans. This information can be entered so that only the raw data is visible to the student, who must then derive the differential diagnosis, guided by images and graphics accessed from the videodisc.

When a student doesn't understand a word, he or she simply holds the mouse button down, and the definition is displayed.

Important terms in the text files include transparent buttons that are linked to a file called Glossary. When a student doesn't understand a word, he or she simply holds the mouse button down on that word and its definition is displayed.

MED-videodisc manager is a powerful computer-aided instructional tool, because it teaches through lectures, clinical management problems, and questions; is reinforced with a glossary; and provides links to an easily controlled library of video images.

Lots of Great Authoring Packages for the Macintosh

In addition to HyperCard, there are a number of authoring packages that can be used to create Macintosh courseware. The following section contains details about a few of the most popular, including a rundown on the uses—and users—for which each program is suitable.

Course of Action

Course of Action, by AuthorWare, is a very powerful, flexible authoring system for designing and developing interactive learning experiences. It combines the power of flowcharting with the simplicity of the Macintosh user interface, making it suitable for both novice and expert authors. With this language, you can create a course flowchart, and then develop the course by clicking on each of the flowchart symbols and designing the CBT. Course of Action features an icon-based design that allows graphic editing of the flow of the course being designed. If you later want to modify the structure of the course, it's as simple as changing the flowchart.

Course of Action combines the power of flowcharting with the simplicity of the Macintosh user interface.

With its ability to incorporate digitized sound, advanced animation, interactive use of a compact disk, connection to a videodisc or CD-ROM, and linkages to external application programs, Course of Action allows for true multimedia presentations.

One of the nicest features of this product is that it allows virtually unlimited branching and can handle an unlimited number of unanticipated answers. In addition, it automatically documents courseware designs and prints a graphic representation accompanied by detailed textual annotation. This particular feature is not often available in an authoring system (for example, such documentation is not easily done using HyperCard).

The product allows virtually unlimited branching and can handle an unlimited number of unanticipated answers.

Course of Action is suitable for the following users and applications:

- This language could be used by anyone, in any field from education to industry. It's simple enough to be useful to people with little knowledge of CBT development, but sophisticated enough to handle complex training.

- It can be used for just about *any* level of CBT. However, it cannot currently simulate the Macintosh interface (which is what my group does). For instance, it cannot simulate pull-down menus and do sophisticated tracking of the mouse pointer. The lack of built-in functions (such as graphics and word processing) can make it cumbersome and time-consuming to use.

The program offers the following advantages:

- The flowcharting tool is very convenient for developing and modifying courses.
- The interface is easy to deal with for course development.
- The program is capable of very sophisticated text answer judging and branching.
- It runs on a Macintosh II (and is capable of using its entire screen).

For more information about Course of Action, contact:
Authorware, Inc.
8400 Normandale Lake Blvd., Suite 430
Minneapolis, MN 55437
(612) 921-8555

VideoWorks Interactive

VideoWorks Interactive is an animation-authoring program.

VideoWorks Interactive (VW/I) by MacroMind is an animation/authoring program. It is not on the market yet, but MacroMind will sell beta copies to interested parties. VW/I is an extension of the original VideoWorks product that enables monitoring of user input (both mouse and keyboard) to allow the provision of appropriate feedback.

This package has very good graphics, excellent animation, and a built-in graphics and word-processing package.

VW/I is suitable for the following users and applications:

- This language is best utilized by people who have an understanding of graphic animation (much like Disney-style animation) and programming. It takes a significant amount of time to become proficient in this language.
- It can be used for *any* level of CBT. It can be used to simulate the Macintosh interface, and has several add-on packages that make it very convenient to use.

The program offers the following advantages:
- It features high-quality graphics and animation capability.
- It can monitor user input (both mouse and keyboard).
- It can simulate the Macintosh user interface.
- It offers branching capabilities.
- It has a built-in graphics package (albeit limited) and word processor.
- It can print screens.
- It has a separate run-time version.
- It makes good use of disk space.
- It runs on a Macintosh II, and can take advantage of both the system's large screen and its color capabilities.

For more information on VideoWorks Interactive, contact:
MacroMind, Inc.
1028 W. Wolfram
Chicago, IL 60657
(312) 871-0987

Guide

Guide, by Owl International, is a hypertext product. It can be used to develop documents (primarily word-processing documents) and link "hot spots" in the document to other documents.

Guide is a hypertext product that can be used to develop linked documents.

The text passages can be linked to Macintosh II color graphics, videodiscs, and other media. Buttons are used to provide users with ways in which to access additional information.

Guide is suitable for the following users and applications:
- This language can be used by anyone. The author has the ability to provide explanations, glossary items, and additional information by establishing links to hot spots in the original document.
- This is *not* a CBT language. It is primarily a way to provide additional information about specific topics. The language is text-based, and the graphics are limited.

The program offers the following advantage:
- It allows clean annotation of text-based documents.

For more information about Guide, contact:
Owl International, Inc.
14218 NE 21st Street
Bellevue, WA 98007

CourseBuilder

CourseBuilder enables you to create courseware that incorporates text, graphics, animation, and sound.

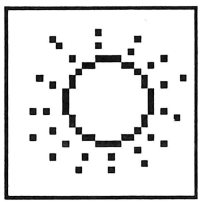
CourseBuilder is a unique visual language that enables you to create courseware by simply drawing a chart of your ideas. Your message can be delivered with text, graphics, animation, and sound. You can design applications to receive input from dialog boxes, menus, and/or mouse clicks. When you combine these features with the power of intelligent branching, flow control, and automatic report generation, you have everything necessary to create state-of-the-art applications.

The program offers the following advantages:

- You can use CourseBuilder to develop stand-alone courseware, so that your users do not need the program to run your applications.
- You can easily use CourseBuilder without having any prior programming experience.
- You can build advanced simulations that utilize movable sprites, gauges, control panels, and various mathematical models.
- Student performance data can be maintained automatically, and files of student performance can be created.
- CourseBuilder allows you to control such external devices as videodiscs, videotapes, and slide projectors.

For more information about CourseBuilder, contact:
TeleRobotics International, Inc.
8410 Oak Ridge Highway
Knoxville, TN 37931
(615) 690-5600

Spotlight



The **Spotlight** section will focus on some of the Macintosh activities that are going on at various schools and universities. Typically, there will be two parts: the first will describe the activities that coincide with the theme of that particular *Wheels for the Mind* issue; the second will be more general, and describe a variety of interesting programs and activities.

Stanford University: The Courseware Authoring Tools Project

This fall, the Courseware Authoring Tools (CAT) Project will begin to provide Stanford faculty with an array of authoring tools that will minimize the programming effort required to develop instructional software.

CAT is a spin-off of the Faculty Author Development (FAD) Project, in which faculty worked as subject-matter experts with a team of professional and student programmers to develop courseware. The CAT Project's mandate proposes an aggressive next step in the evolution of faculty into courseware developers: to facilitate the ability of faculty members to be the primary—if not the sole—authors of their courseware. This mandate evolved from a desire to nurture a greater number of faculty courseware authors than could be accommodated in the personnel-intensive scenario dictated by the FAD Project.

The CAT Project's mandate proposes an aggressive next step in the evolution of faculty into courseware developers.

The CAT "Toolbox" will feature tools developed by the CAT team, as well as those culled from other universities and from hardware and software vendors. CAT-developed tools will include a systems-modeling toolkit for application in engineering-related disciplines, a toolkit for generating simulations in the humanities, and general-purpose systems-development tools to create, edit, manipulate, and animate (as appropriate) text, bit-mapped images, graphs, matrices, and equations. CAT will assist faculty in their development effort from the initial attempt to formulate and document courseware ideas to the final delivery of the resulting application.

CAT team members will meet with faculty to discuss and formalize their instructional software ideas, determine which authoring tools would be appropriate for the application, demonstrate the tools, and train the faculty. CAT will support faculty projects by offering consulting advice as needed and by providing a development lab, equipped with hardware and CAT software, in which faculty can develop their applications. The development lab will also be used as a classroom in which faculty can deliver their courseware to students.

For more information, contact:
Barbara Jasinski
CAT Project Manager
Stanford University
3091 Sweet Hall, 4th Floor
Stanford, CA 94305
(415) 723-1055

University of Rochester: TALK (Teacher's Authoring Language Kit)

TALK allows teachers to combine text with interactive graphics and digitized speech.

TALK (Teacher's Authoring Language Kit) is an authoring tool that allows teachers to combine text with interactive graphics and digitized speech—without previous programming experience. It was developed at the University of Rochester, and is used there in foreign language instruction.

The text files for the foreign language courseware are created using MacWrite® or Microsoft Word (saved as text only) in conjunction with any foreign font available for the Macintosh; the graphics are drawn with MacPaint and edited with a Graphics-Editor tool that inserts "pop-up" vocabulary menus; and sound or speech input is digitized directly from a microphone or audio recording using the hardware and software provided by SoundWave (from Impulse, Inc.).

These elements are integrated by the TALK program (50K, written in LightspeedC), which reads "dot" commands. (These commands are lines that begin with periods—for example, .question, .answer, or .picture. They are embedded in the body of the main text file. Multiple fonts are also controlled by a single dot command.)

The student interface includes the following:

- A Question window from which text can be copied
- An Answer window in which all standard editing features are operable

- A Graphics window in which pop-up menus can be used to transfer vocabulary to the answer window
- A Control Panel for checking answers and accessing the sound files
- A scroll bar for reviewing previous answers

There is no preset curriculum for TALK; teachers are free to create whatever questions, graphics, or sound cues they wish.

For more information, contact:
Robert Blake
Foreign Languages, Literatures, and Linguistics
University of Rochester
Rochester, NY 14627

Berea College: Macintosh Use in Instruction and Administration

Berea College is a four-year liberal arts college of 1,550 students, 80 percent of whom come from the Southern Appalachian area and the state of Kentucky. One of the goals of the college is to make a sound education available to students whose families are unable to finance a college education, but who have the ability and the character to use a liberal education for responsible, intelligent service to society. Berea does not charge tuition, and every student works at least two hours per day at a job on campus.

The computer is very much a learning tool at Berea.

Even though the school has no computer science major, the computer is very much a learning tool at Berea. Students have access to a Prime time-sharing system and to various microcomputers that are scattered across the campus. Two-thirds of the total student body actively use computers to do word processing, programming, statistics, simulation, and other activities connected with their areas of interest. Classroom demonstrations on Apple computers are done using Limelight projection systems.

More than half of the faculty members have Macintosh systems on their disks.

Although student use has been a high priority at Berea, faculty are also using the Macintosh. This fall, Berea will purchase 50 more Macintosh systems. This will mean that 60 professors—of the total teaching faculty of 114—have Macintosh systems on their desks.

Housed in the library for student use are 16 Macintosh computers networked to a 72-megabyte AST hard disk, using MacServe to access curriculum software. The network gives students access to MacWrite, MacDraw®, MacPaint, Microsoft Works, StatView 512, Nutri-Calc plus, True BASIC, and various utilities packages. A second network of eight Macintosh computers with 24-hour access will be in place soon. There are 437 pieces of software that can be checked out from the library's reserve desk. There are also microcomputer clusters in the science building, reading/writing lab, industrial arts building, and business department. In addition, students may use a LaserWriter in the Computer Center to print their resumes and special papers. This LaserWriter printer is connected to an Apple®IIe, a Macintosh, and the Prime system. As an experiment, Macintosh labs will be placed in a few residence halls next fall. If these are successful, more labs will soon follow.

Berea also conducts workshops and camps for secondary schools, other colleges, and users in the community. Starting last summer, students and faculty began conducting Apple Logo camps for junior high and high school students. This summer, a remedial reading and math camp for elementary students was added.

The school newspaper and the alumni magazine are each in their third year of being produced using PageMaker on a Macintosh. In fact, through prompting from the college, the local newspaper now uses the Macintosh to prepare its pages for printing.

The corridors are alive with talk of databases, spreadsheets, word processing, and the need for more laser printers.

On the administrative side, Berea has Macintosh systems in 10 offices. Secretaries who had difficulty using the Prime system are singing the praises of the Macintosh. Last January, 27 members of the office staff attended workshops on Microsoft Works. Now the corridors of Lincoln Hall are alive with talk of data bases, spreadsheets, word processing, and the need for more laser printers. In the college's physical plant, five Macintosh computers are linked to a Corvus hard disk using Omnis 3 for inventory control and work orders. And in the college-operated Boone Tavern hotel and restaurant, Apple IIe computers are used for making room reservations and billing, and as cash registers. These two systems have been in use and working smoothly for two and four years respectively.

Berea College has several Macintosh systems on campus connected to the Prime, using communications software to exchange data between the minicomputer and the microcomputers. Also, a new telephone system with phones in each dorm room is making software such as PhoneNET a serious consideration for linking students' micros to the Prime.

We are eagerly looking forward to what the future holds for computing at Berea.

For more information, contact:
L. D. Montgomery, Director
Computing Center
CPO 2292
Berea College
Berea, KY 40404

Drexel University: Macintosh and Adult Literacy Education

Drexel University has worked with the Mayor's Commission on Literacy in Philadelphia to introduce the Macintosh computer as a tool in adult literacy education. Funded by a grant from the Pennsylvania Department of Education, Drexel has leased 25 Macintosh computers and seven printers to seven literacy sites spread across Philadelphia.

Drexel has leased 25 Macintosh computers to seven literacy sites.

Some 80 literacy coordinators and coaches attended training sessions on the use of various instructional software packages. They were also taught how to use Microsoft Works, which will serve the project both as an instructional tool and as a productivity tool. Microsoft supported the project by providing complimentary copies of Works in addition to those purchased.

The computer has the same instructional benefits for the adult learner as it does for elementary and secondary students. It has infinite patience, as well as a certain inherent attraction that makes learning enjoyable. In addition, literacy centers have found that, in many cases, students can do independent work using a computer more easily than they can using conventional materials. The centers have also found that many students will come in for some practice on the computer even when their tutor is not available.

The Macintosh is an appropiate computer to be used in such an instructional setting because of the iconic design of its interface and its ease of use. In using the computer for the development of reading and language arts skills, students are also learning such valuable job-related skills as keyboarding, microcomputer use, and word processing. One of the programs being used in the centers is Resume Writer. This software not only enables students to improve their language arts skills while preparing attractive personal resumes, but it also provides them with instruction on how to create a resume that represents them effectively.

The intent is to use some of the new authoring tools, such as HyperCard, to create instructional software.

The project has been funded for the coming year, and part of the support will be for the development of courseware designed for adult literacy students. The intent is to use some of the new authoring tools on the market, such as HyperCard, to create instructional software designed for the adult learner. Apple Computer has also provided a generous equipment grant to sustain the efforts initiated by Drexel.

The project has aided many adult literacy students, by giving them an extra advantage in their efforts to attain their goals. It has been a mutually beneficial collaboration, and it is hoped that it will serve as a model of university, municipality, and corporation cooperation to remedy a serious societal problem.

Stanford University: Computer-Assisted Thinking

What are the thinking styles, strategies, and problem-solving techniques of world-class thinkers and experts?

How can high-technology tools help one to become a more efficient and effective thinker?

The special twist in this creativity course was an emphasis on exploring the use of Macintosh software.

These were the central questions addressed in a new course titled "Critical Thinking and Creative Problem Solving," sponsored by the Center for Teaching and Learning at Stanford University this summer. The course focused on examining the key thinking skills and practices of peak performers in academia, business, and government. Our goal was to master pragmatic techniques and strategies for generating practical solutions to challenging problems. The special twist in this creativity course was an emphasis on exploring the use of Macintosh software designed for idea generation, processing, and presentation.

Our class sessions interwove discussions of relevant theory and empirical studies from psychology and artificial intelligence with intensive practice sessions—with and without the Macintosh—on problems supplied by the instructor and by class members, roughly half of whom were Stanford managerial staff.

Each student was required to maintain a "Thought Journal" to record key experiences and problems encountered in thinking and learning during the course. This record served as an intellectual and emotional history of each class member's development. Students recorded triumphs, proclaimed insights, documented frustrations, asked questions, and voiced gripes—all as feedback to the instructor about their own personal progress in improving the way that they thought and solved problems.

Each student was also required to select a software product proclaimed to be useful for better thinking and to get to know that product well through hands-on use for a project of personal importance. Suggested tools for better thinking and idea presentation included Calliope Plus, MaxThink, MindWrite, MORE, PageMaker, PowerPoint, ExperLogo Plus, ObjectLogo, and SideKick.

Designers of several of these products served as guest lecturers and provided demonstrations for the class. Some lively discussions ensued, with students recommending expanded or new features for better thinking.

Designers of several of the products served as guest lecturers.

While all the students were well aware of powerful software to augment secretarial skills (word processors, database managers, spreadsheets, and so forth), many were initially dubious that personal computers could help them think better. I'm delighted to report that word-of-mouth about this course and the innovative Macintosh software being examined led to more students joining each week—and necessitated changing our meeting place three times to accommodate the newcomers!

Judging from the overwhelmingly positive reaction of my students, many of whom had never used a Macintosh before, there is a real demand for more and better tools to augment creative thinking and problem solving.

For more information, contact:
Dr. James Milojkovic
Department of Psychology
Stanford University
Stanford, CA 94305
(415) 921-4290

Bowling Green State University: School of Mass Communication

The School of Communication at Bowling Green State University has equipped a new journalism lab with 15 Macintosh 512K Enhanced computers, one Macintosh Plus computer, a LaserWriter printer, and an ImageWriter II printer.

The lab is used primarily for classes in journalism, but it also functions as an open lab during the time when classes are not in session. Under supervision, any student with a major in the School of Communication can use the lab for assignments and coursework. The School of Communication includes both the Department of Journalism and the area of Radio-Television-Film. Other students earning degrees on the bachelor's, master's, and Ph.D. levels also have access to the computers.

For more information, contact:
James H. Bissland, Ph.D.
Acting Director
School of Mass Communication
Bowling Green State University
Bowling Green, OH 43403-2069
(419) 372-2076

Cornell University: Blue Pencil

The program grew out of comments Cornell received about PROSE.

Blue Pencil is being designed as an editorial marking program for Macintosh documents. The program grew out of comments Cornell received about PROSE (Prompted Revision of Student Essays), another Macintosh program developed at Cornell.

Blue Pencil will allow the same sort of commenting that PROSE does, with the added ability to have a chain of comments by different editors. Suggested revisions can be viewed in the context of the document. Comments can then be reviewed by the author, and suggested revisions tried out and accepted, if desired.

Blue Pencil is currently in the design and prototyping stage. It is hoped that a program will be produced that can be easily adapted for use in a variety of fields. Suggestions are welcome.

For more information, contact:
Chris Pelkie
Computing and Communication Center
Cornell University
Ithaca, NY 14853
(607) 255-8321
AppleLink: A24

Institut fur Informatik, ETH, Zurich: Gambit

Gambit is a powerful database design and prototyping system for the Macintosh.

This university in Switzerland has developed Gambit, a powerful database design and prototyping system for the Macintosh. This tool works with the RDS relational database system, which was also developed at the Institut. It is used to design the structural and functional aspects of a conceptual schema. The supported data module corresponds to the extended relational model.

Gambit supports the following parts:

- Complete definition of conceptual schemata, including user-defined integrity constraints of various complexity, with graphic representation of the entity block diagram.
- The definition of the physical data organization (internal schema).
- The graphical design of transactions, including propagation paths.
- The automatic generation of database definition and implementation modules, up to the production of a full prototype system containing thousands of line of source code, without programming a single statement.
- The initialization of the database.

MacMETH, a Modula-2 development system for Macintosh, is necessary for using Gambit's prototype system. Gambit can be obtained as a stand-alone Macintosh application or in source form.

For more information, contact:
Gambit Distribution
Institut fur Informatik
ETH Zurich
CH - 8092 Zurich
Switzerland

Houston Community College: Desktop Publishing

The communications department of the Houston Community College System has a new, rapidly expanding desktop publishing program. The college has been successfully using Apple IIe, IBM, and Macintosh computers for Technical Writing on Microcomputers, Freshman English, and other courses for several semesters.

A highlight of the year was the development of one of the first desktop publishing certificate programs in the U.S.

A highlight of the 1986–87 school year was the development of one of the first desktop publishing certificate programs in the United States, with a wide range of courses making up the 28-semester-hour requirement. Microsoft Word 3.0, SuperPaint, and MacProject®have already been added to MacWrite, MacPaint, and MacDraw in the first two courses. At the intermediate level, students learn PageMaker, ReadySetGo, and other desktop publishing packages. Three technical writing courses and two editing courses help students learn to write, edit, format, and design copy for correspondence, bulletins, newsletters, brochures, advertising, reports, technical manuals, and books. Specialized courses in computer graphics are to be implemented this summer, so that students can handle clip art, Graphic Works, Cricket Graph, Cricket Draw, Adobe Illustrator, and PowerPoint.

At advanced levels, students have the opportunity to learn Microsoft Works, MORE, PageMaker, Ventura and PageMaker for the IBM, FileMaker Plus, Reflex, and Microsoft Excel. Faculty members are currently testing prerelease versions of Scoop, By-Line, Textures, and Textra. The program's courses are in such demand that more Macintosh lab facilities have to be added immediately.

The college is purchasing four Macintosh SE 20-megabyte hard-disk systems, a 19-inch SuperMac monitor, and a second LaserWriter Plus printer to add to the existing 12 Macintosh Plus/LaserWriter systems. A second Macintosh SE lab with up to 24 stations has been wired, and more than 100 students are on the waiting list for the second summer session if a second lab can be built. Other departments, such as computer graphics, typesetting, graphic arts, and CAD/CAM are interested in having students use the Macintosh labs and in offering courses that will lead to a desktop publishing degree.

Industries in the Houston area are asking that their employees be trained on the Macintosh SE computer and the new Macintosh II color systems. A third lab, with 18 Macintosh II color systems, will satisfy interdepartmental and industry-training requirements through the Houston Community College system. College budgets—particularly in Texas—are extremely limited, but with grants and help from large corporations, lab facilities will be increased as soon as possible.

Industries in the Houston area are asking that their employees be trained on the new Macintosh systems.

Houston's economy has taken a downturn in recent years, due to the slump in the oil industry. Desktop publishing is one of the new industries that is providing employment opportunities for our students as soon as they are ready to work. At least five new desktop publishing businesses have opened up in the Galleria area, the hub of Houston. An ad ran in the *Houston Post* recently for 25 desktop publishers, and the communications department receives frequent calls for desktop publishing store managers, sales personnel, trainers, designers, writers, and graphic artists who have been trained in the school's courses.

Large companies such as NASA, Boeing, and Standard Oil, and major accounting firms, law firms, medical offices, printing companies, and software companies are hiring Houston Community College students. And while selected students are learning, they have the opportunity to earn college credit for working under the internship program. Several have already started their own businesses with expertise gained from these classes.

MIT's Sloan School of Management: Systems Dynamics

The Systems Dynamics Group at Sloan has been a prolific user of Macintosh software, including STELLA, a tool for enriching the understanding of, and intuition for, the dynamics of social and physical systems. The systems dynamics courses are among the most computer intensive at the Sloan School. Beginning with the

Students frequently cited the combination of STELLA and the Macintosh as a major strength of the classes.

fall semester in 1985, the courses were converted to rely exclusively on the Macintosh. The students use STELLA to create their simulation models, and MacDraw and MacWrite to create the final documentaion for their projects. In course evaluations, students frequently cited the combination of STELLA and the Macintosh as a major strength of the classes. Several students have gone on to do thesis work and undergraduate research projects using the Macintosh, often involving corporate sponsors in the work.

One seminar in macroeconomic dynamics used a Macintosh with STELLA interactively as an animated blackboard to perform experiments and test theories. Student used the Macintosh to demonstrate their term projects and were thus able to get immediate and sophisticated feedback from their classmates.

Courseware and simulation models tailored to the Macintosh and STELLA have been developed, including models and case studies in management, economics, ecology, psychology, and management of technology, among others. In addition to the regular Sloan course offerings—Principles of Dynamic Systems I, Systems Dynamics for Business Policy, Systems Dynamics Applications, and Economic Dynamics—the Macintosh and STELLA have been introduced into the summer executive program course: Corporate and Economic Policy Design with Microcomputers. The executive participants enjoy the hands-on experience building and using their own models directly on the Macintosh.

For more information, contact:
Systems Dynamics Group
Sloan School of Management, MIT
Building E40
1 Amherst Street
Cambridge, MA 02139

University of Pennsylvania: Tutorials for Prolog and Logo

The school offers a series of courses designed to help students learn to appreciate the style of engineering thinking.

The School of Engineering and Applied Sciences offers a series of courses designed to help students from a variety of backgrounds learn to appreciate technology and the style of engineering thinking. One such course uses the Logo and Prolog computer languages as a means of teaching styles of engineering thinking, design, and creativity. Both of these languages are somewhat unusual in that they are strongly oriented toward symbolic manipulation rather than straight computation. They make powerful use of such ideas as recursive thinking, procedural organization, and structured design—ideas that are not natural to our thought processes, but that play major roles in engineering practice.

Both to improve the delivery of the course and to demonstrate the power of these concepts, much of the language instruction is based on on-line tutorials written in the languages themselves. The tutorials are presented to the students as projects.

Methodology:

Create on-line tutorial systems in both Logo and Prolog that will run on the Macintosh Plus system. The criteria used are as follows:

- The tutorial should make full use of Macintosh features such as pull-down menus, windows, Toolbox routines, dialog boxes, and mouse control.
- Each tutorial should give the student full access to the target language.
- Not only are the tutorials to be constructed in the target language, but the tutorial should be covered as a topic within the tutorial (a recursive idea in itself).
- The tutorials should adapt to student progress, by including quizzes and feedback features.

For more information, contact:
Dr. Jeff Seaman, Director
Computing Resource Center
1202 Blockley Hall
University of Pennsylvania
Philadelphia, PA 19104-6021
(215) 898-1780
AppleLink: A77

Portland State University: Desktop Publishing the School Paper

With the Macintosh and professional typesetting equipment, Portland State has the best of both worlds.

Combining the ease-of-use and the what-you-see-is-what-you-get capabilities of the Macintosh with the clarity and precision of professional typesetting equipment, the Portland State *Vanguard* has the best of both worlds.

This spring, the student newspaper purchased a software interface to the Compugraphic MCS phototypesetter that converts Macintosh documents to files that will run on the Compugraphic system. The interface, the Mumford Micro-Set, allows the Macintosh to

communicate with the typesetter by creating disks that are just like the 5.25-inch disks the typesetter uses. To do this, a 5.25-inch disk drive and a special controller attached to the Macintosh serial port are used. Text for typesetting can be created with any word processing program and then saved on the disk as a "text only" file. Graphic artists on staff can use any of the graphics programs available for Macintosh to create their advertisements. Micro-Set translates these files to MCS coding and copies them onto appropriate Compugraphic disks, which can then be run on MCS drives.

The Micro-Set also gives the *Vanguard* the ability to copy files from MS-DOS disks to Macintosh disks, from which they can then be converted into Compugraphic-compatible files.

It came down to economics-for the price of one Compugraphic preview screen, the* Vanguard *could purchase the interface and two Macintosh computers.

To help support the system, the *Vanguard* has already purchased two Macintosh computers: a Macintosh Plus and a Macintosh SE. *Vanguard* staff plan to add more soon. The decision to invest in Apple products rather than merely adding more Compugraphic equipment was an easy one for the newspaper. Essentially, it came down to a question of economics—for the price of one Compugraphic preview screen, the *Vanguard* was able to purchase the $1,500 interface and the two Macintosh computers.

The primary advantage the software offers over traditional desktop publishing solutions is its printing resolution. The MCS allows the *Vanguard* to produce the 3,000 dpi output to which it has become accustomed. Because of the excellent resolution and resulting high quality, the *Vanguard* is hoping to expand its operations and make its quality typesetting available to other student groups on campus.

For more information, contact:
Greg Needham
Portland State University
The Vanguard Student Newspaper
P.O. Box 751
Portland, OR 97207
(503) 229-4531

Stanford University: Classroom Video Network

The Interactive Classroom Experiment (ICE) at Stanford University was conceived to allow experimentation with classroom delivery systems, including video projection technology, video switch technology, and file and print servers.

About ICE

The microcomputer offers a unique personal learning environment, which can be expanded using interactive courseware (instructional software that allows both student input and immediate feedback). IRIS operates two classrooms designed to study and use this mode of learning. In their first quarter of operation, the classrooms are being used for such diverse interactive computerized instruction as tutorials on elementary economic concepts, cloze drills in beginning and advanced French courses, a theater performance simulation for creating and interpreting plays, and electronic spreadsheets for resource planning in civil engineering.

The unique personal learning environment the microcomputer offers can be expanded using interactive courseware.

One classroom contains a network of 20 IBM Personal Computer XTs. The other interactive classroom contains a network of 35 Apple Macintosh Plus microcomputers with access to the Stanford University Network (SUNet), a campuswide network providing communications among all of the campus computers generally available to students and faculty. In addition, local area file service allows students to load software from a central location (a Sun workstation) rather than using multiple floppy disks. This server was built using 3Com interface cards, Ethernet cabling, and PC-NFS software from Sun Microsystems. A color projector allows the instructor to display his/her screen to the students. In the upcoming months, videodisc capabilities are slated to be added to this classroom.

IRIS anticipates using the classrooms for empirical research in modes of computer learning, courses in software development, courseware demonstrations, and as homework clusters.

Video Technology in ICE

Video technology is at the core of our use of instructional media in ICE. The basic structure of the IBM PC-XT and Apple Macintosh classrooms is the same. We provide a system in which students share common software and printer resources via local area networks, and in which instructors have the ability to display activity on their workstations for demonstration purposes. In the Apple Macintosh classroom, additional video capabilities allow the instructor to preview any student's computer screen and display any computer screen in the room on the classroom projector. A description of these capabilities and their technologies follows.

Video technology is at the core of our use of instructional media.

There are some important caveats to keep in mind when you build a video system; this is shorthand for rules of thumb we learned in building ICE:

- When cabling is done, proper termination of the video network is critical to proper operation.

- Test equipment should be used to test signals from each of the personal computers before connecting the video network, since operation of many of the peripheral devices and projectors depends on proper signal strength and synchronization. The single most important issue in designing the network is compatibility of products with respect both to scan rates for monitors and projectors and to cable interface types.

- Consultants for video testing, setup, and performance evaluation should be considered in spite of the high rates charged for consulting in the video industry. They provide expertise in the construction of the video network and in diagnosis of problems.

Macintosh Classrooms

Macintosh computers have been modified to provide video output signals.

In the Macintosh classroom, Macintosh Plus computers have been modified to provide video output signals using the MacVideo interface from Comtrex Ltd. This is a user-installed card that provides a standard BNC-type coaxial connection. Wire in the classroom is pulled through conduit in the floor using off-the-shelf RG 59 video coax cable and BNC connectors. The Macintosh computers are connected to a HEDCO 30-megabit bandwidth video switch with computer control options. This provides options for 40 input channels (the workstations for students and faculty) and two output channels, all of which are software selectable or hardware switchable. One output channel is attached to a BARCO/HR RGB projector; the other to an Electrohome EVM1220 monochrome 12-inch monitor, which the instructor can use to preview screens. At the instructor's station, there is a Macintosh Plus workstation, the preview monitor, and a Macintosh Plus that provides software-driven switching capability for both the projector and preview monitor.

The HEDCO video switcher has logic hardware that can be addressed by software commands; it took a week of experienced programmer's time to design a visual software interface based on an on-screen map of our classroom. The HEDCO can also be controlled by a hardware switch, available through the company, providing buttons for selecting input and output channels.

The BARCO/HR projector was selected after we reviewed an arc-lamp projection unit from Hughes and a variety of monochrome projectors including Vivid Systems' Limelight and various Electrohome units. With a large classroom, it was evident that a high-intensity lamp was required, ruling out the popular classroom units. The Hughes projector, while providing high intensity and excellent projection, left a "tracer," or ghost image, when the screen displayed moving graphics such as a cursor or animation sequences. It is recommended that others try various technologies to find those that suit their environment, especially emphasizing room size and ambient light.

Contact these companies directly for information regarding connectivity issues:

Video switcher
HEDCO
P.O. Box 1985
Grass Valley, CA 95945
(916) 273-9524

BARCO/HR projector
BARCO
Home Office: Atlanta, GA
(Call for local distributors.)

MacVideo interface
Comtrex Ltd.
P.O. Box 5500
Newport Beach, CA 92662
800-443-2751, ext. 130

12-inch preview monitor
Electrohome
250 Wales Ave.
Tonawanda, NY 14150
(216) 694-3332

For more information, contact:
Steve Loving
Instruction and Research Information Systems (IRIS)
Sweet Hall, 3rd Floor
Stanford University
Stanford, CA 94305-3091
(415) 723-1055

Free University of Amsterdam: Department of Chemistry

By J. G. Snijders and W. Ravenek

In the past year, the Department of Chemistry of the Free University of Amsterdam has seen an explosive growth in the number of personal computers. The Apple Macintosh was chosen as the standard personal computer in the department because of its superior graphics capabilities and intuitive user interface, as well as the accessibility of its extensive software Toolbox.

We are currently using the Macintosh in the following areas:

- Scientific text processing (all secretaries have a Macintosh)
- Statistical and graphical analysis of experimental data
- A variety of educational purposes, in particular data acquisition and control of experiments in undergraduate laboratory courses
- Terminal emulation to access our (CDC) mainframe computers

We have developed some software that might be of interest to* Wheels *readers.

In these last two areas, we have developed some software that might be of interest to the readership of this journal. In the first place, a program was written to perform an automatic titration experiment and to simulate such experiments. The real-world interface is through a data-acquisition system (Optomux) connected to the Macintosh serial modem port, which is driven by a control routine flexible enough to be used in a variety of experiments that are being automated here at the moment.

A second project is a terminal emulator (Flits) that is better adapted to the preferences of the mainframe users in this department than commercially available products. This emulation program has some properties (notably the possibility of local editing) that might appeal to a wider audience. In both cases, the software was written with the TML Pascal development system.

Optomux

As our control and data-acquisition system, we chose the microprocessor-based Optomux (manufactured by Opto 22, Huntington Beach, California), which functions under the control of a host computer via a serial communications link. It allows up to 256 units with 16 modules each to be integrated in a network. Available units include digital modules for AC/DC input and output, and analog modules for input (4-20 mA, 0-5 volts DC, 0-10 volts DC) and output (4-20 mA).

Because of its transaction-oriented protocol, which can be either two-pass or four-pass, the Optomux system works well with an event-driven Macintosh application. Opto 22 supplies a driver for the MC68000 that carries out the handshaking and performs extensive error checking. The command set for the digital modules includes output control (on/off), input status reading, event counting, latched input, pulse duration measurements, time delay, and pulse generation. The command set for the analog modules includes reading of inputs, input averaging, input range monitoring, and output waveform generation.

We have written a Pascal interface to the driver routine and an error-checking procedure that supplies an application with alerts containing the error messages that correspond to the Optomux error codes.

Titrator

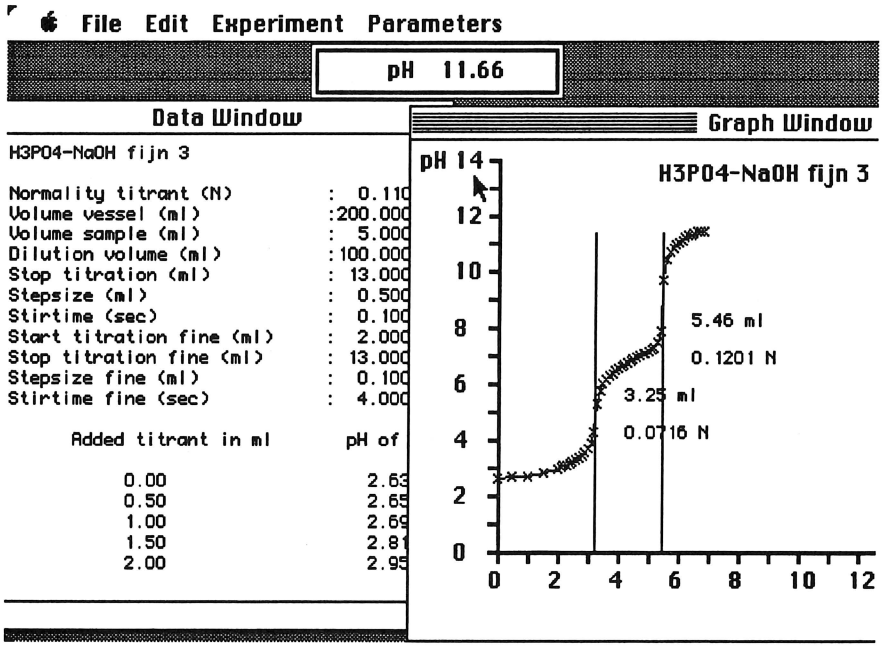
Introduction

Titrator is a program that controls acid-base titrations.

Titrator is a program that controls acid-base titrations. A titration is an analytical chemical technique for determining the concentration of a substance in a solution by the process of adding a reagent solution (titrant) of known concentration (titer) until all the substance has reacted (that is, until an equivalent amount of titrant has been added). In an experiment controlled by Titrator, titrant is added in small, constant increments, and the pH of the solution is measured at regular intervals. From the acquired data, the program calculates the equivalence point.

The experimental setup consists of a vessel containing the sample and a magnetic stirrer, placed over a stirring motor, a motor buret, and a pH electrode. The latter two elements are connected to a digital and an analog Optomux unit, respectively. The motor buret is used to add small, constant volumes of titrant; it does so when it receives a pulse from the Optomux. The electrode potential is a linear function of the pH.

The Titrator screen



Control aspects

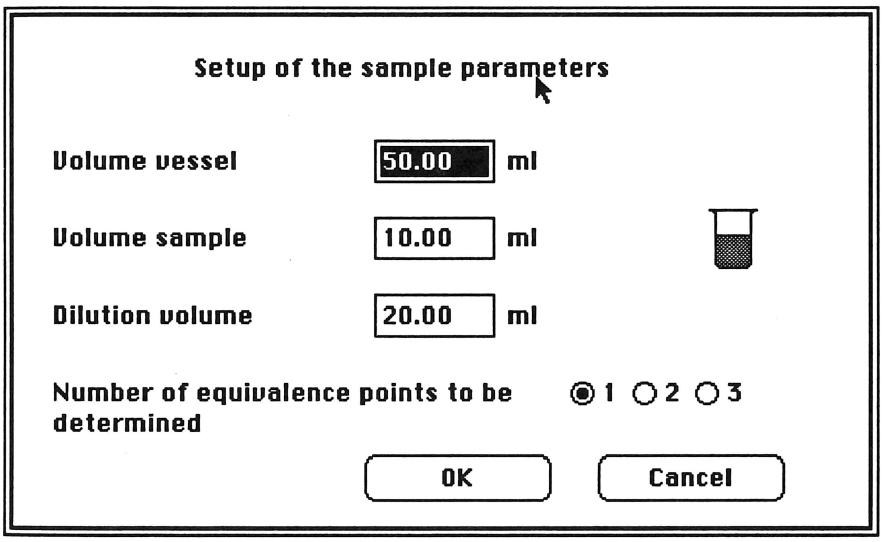
The experimenter adds a volume that is a multiple of the buret pulse volume, waits for some time to let the solution become homogeneous, then reads the potential and converts it to a pH. In our program, the experiment is completely controlled in the main event loop. This is possible because of the transaction-oriented protocol of the Optomux and because a longer stir time than the minimum time (when properly chosen) does not interfere with the experiment. Once the Optomux units are properly initialized, the commands used for controlling the experiment are quite simple: latch the digital output unit for a period long enough for the buret to dispense its minimum volume of titrant (0.1 ml in our case), and read the potential via the analog module.

A titration experiment contains a number of variables, which may be divided in two categories. The first category consists of those variables that pertain to the experimental setup (minimum release volume of the buret, required pulse duration, Optomux addresses, and so forth). Titrator obtains these parameters from an STR# resource in its resource file, so they can be changed easily. The second category consists of variables that can be explicitly controlled by the user.

Use of Titrator

In a typical titration experiment, the user starts with a calibration of the pH meter by measuring the electrode potential of two buffer solutions of known pH. This calibration is controlled by a modal dialog activated from the Experiment menu.

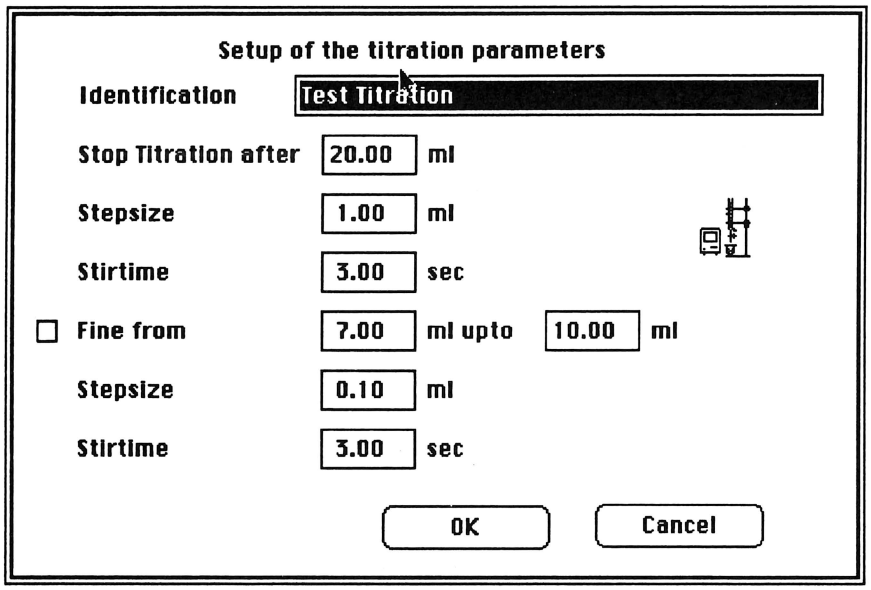
Next, the user makes the experiment parameters known to the program. From the Parameters menu, he or she can select the Buret, Sample, and Titration commands, each of which activates a modal dialog in which the parameters can be assigned a value. The Buret dialog pertains to the content of the buret: acid/base and titer. The Sample dialog allows the user to set vessel volume, sample volume, dilution volume, and number of expected equivalence points.



Sample dialog

The Titration dialog allows specification of the maximum volume of titrant to be added, as well as the amount of titrant added in each step (the step size) and the stir time (that is, the time to be allowed for stirring before the pH is actually recorded). The program offers two ranges, each with its own step size and stir time. In practice, users start with a coarse titration to get an idea of the position of the equivalence point(s), followed by a second titration in which they use smaller steps in the neighbourhood of the equivalence points in addition to a coarse step size in the regions away from these points. Parameters that are not specified will take a suitable default value.

Titration dialog



Having set the experiment parameters, the user can start the experiment by selecting the Start Titration command from the Experiment menu. During the titration, the program continuously displays the measured pH, which is updated in the main event loop. Furthermore, it displays the acquired data as a graph in the Graph window and as text in the Data window. The experiment can be stopped before completion by the Stop Titration command, which toggles with the Start Titration command. Once a titration is finished, the accumulated data can be saved in various ways. The program allows both the graph and the text to be printed or copied to the Clipboard, and it allows the text to be saved as a Text file and the graph as a PICT (MacDraw) file. The students performing the titration experiment with Titrator are required to make a report as a MacWrite document containing the graph produced by the program.

An additional feature is the ability to perform a simulation of a titration experiment.

An additional feature is the ability to perform a simulation of a titration experiment. In a simulation, the program obtains its data from a Text file with a format such as that produced by the Save Data command, rather than by measuring them. Thus, a different number of equivalent points can be determined from prerecorded data, or a titration graph can be drawn from data that was obtained by means other than Titrator.

Terminal Emulator (Flits)

Flits is characterized by the following properties, some of which set it apart from other available emulators:

- The program consistently uses the so-called block (line send) mode (that is, lines are only transmitted to the host after the Return or Enter key is pressed), instead of the usual character mode, which transmits each character to the host immediately when it is typed. This provides the significant advantage of enabling local editing. What's more, previously transmitted lines can be retransmitted to the host by positioning the cursor in a line and using the Enter key. This gives the user a local editor (very similar to Apple's EDIT) that can communicate with a mainframe.

- Input to the host and output from the host can (but need not) take place in two separate windows. These windows are vertically and horizontally scrollable, and can be moved, resized, and "zoomed" (on a Macintosh Plus). The advantage is that commands to the host, which are often repeated, can be grouped in one window, without intervening responses from the host (which are displayed in the other window).

- The last 250 lines of each window are saved and can be made visible again by scrolling, so they can be retransmitted to the host, possibly after local editing.

- All Macintosh fonts, sizes, and styles can be used. This feature was added because it turned out that different users had very different preferences in this area. For white-on-black diehards, inverse video is available.

- Communications protocol parameters (baud rate, parity, and so forth) can be saved from session to session.

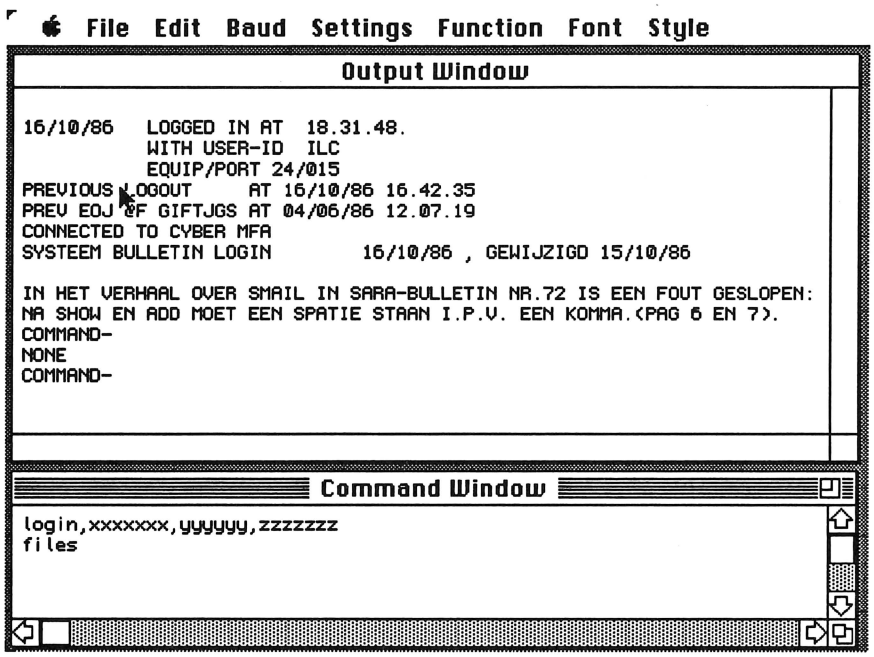
- It is possible (using MacinTalk) to make the Macintosh pronounce a selection in any window. This is useful in particular when checking input that is very error prone, such as a DNA sequence. Without this feature, two people were often involved in checking such input, one reading the input from paper, the other checking the screen.

- Twelve function keys can be defined, edited, and saved.

- File transfer between the Macintosh and the host is possible through a straight ASCII protocol.

- The desk accessories are available (of course).

The Flits screen



Availability of the Programs

Both Titrator and Flits can be obtained from the authors through EARN (BITNET). Just send us an E-mail message (address: U00055@HASARA5). Pascal source code is also available under certain conditions.

The program will be transmitted in the Hexbin-4.0/PackIt format, usual for electronic-mail exchanges of Macintosh programs (*see the article "Transferring Macintosh Files Through Electronic Networks" by Rick Jansen in this issue of* Wheels for the Mind).

Drexel University: DNA Sequencer

Drexel is collaborating with the DuPont Company.

Drexel University and the DuPont Company are collaborating on an important project that will have significant impact on the field of life science. DuPont has developed a product that automates the process of sequencing and mapping DNA. The Macintosh II was chosen by DuPont to act as the "front end" of the sequencer, and Drexel University programmers are writing the software that will interface with and control the sequencer, as well as analyze the resulting data.

The DuPont Company has been deeply involved in DNA sequencing since the technique was developed in the late 1970s. In conjunction with the National Cancer Institute, DuPont scientists were the first to sequence the nucleic acid of the AIDS virus.

DuPont's effort on the DNA sequencer began more than three years ago and was inspired by scientists who saw how important sequencing was becoming and also understood that the manual process is extremely tedious, labor-intensive, and time-consuming. Because accuracy in the process is essential, many top scientists must invest a great deal of time and effort into the procedure, when their interest is solely in the information to be gained, not in the process of attaining it.

After considering several microcomputers to serve as the driver for the sequencer, DuPont engineers decided that the Macintosh II met more of their criteria than any other machine. Its advanced graphics capabilities were particularly important to them.

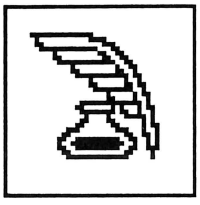
After considering several microcomputers, DuPont engineers chose the Macintosh.

DuPont and Apple approached Drexel University in an effort to secure the programming expertise necessary to produce the interface required to meet the expectations of the scientists and engineers developing the sequencer. Drexel is a substantial source of Macintosh expertise; the university has its own staff of professional programmers dedicated to developing courseware applications for the Macintosh. This development effort has established Drexel as a leader in courseware production for the Macintosh.

Currently, three of Drexel's senior programmers are on loan to DuPont to write the user interface and other related software for the sequencer. The sequencer prototype is scheduled for beta release in the fall, and will be seeded to several outstanding figures in the area of molecular biology. Soon after, the product will be available commercially.

This is a unique opportunity for Drexel to be involved in a development that has far-reaching implications for research in the life sciences. An extensive explanation and description of the sequencer will be published in a scientific journal this fall.

News and Notes



New Products from Apple

Keep your eyes open for these new products from Apple Computer. All of the following products were announced at Macworld in Boston. They either have already been released or will be released shortly.

The Apple ImageWriter LQ Printer

A letter-quality dot matrix printer.

This product is ideal for users who need a versatile dot matrix printer that can produce letter-quality text and graphics. It also offers paper handling, color, and networking capabilities.

Compatible with both Macintosh and Apple II personal computers, the ImageWriter LQ is designed to print virtually any type of document on almost any type of paper, with ease and clarity.

Exceptionally flexible paper-handling features—including a single push/pull tractor, a bottom feed, and an optional cut-sheet feeder—let you effortlessly print multipart forms, heavy-gauge paper, envelopes, and labels, in addition to standard reports or correspondence. A 15-inch-wide carriage lets you print financial spreadsheets and, with the addition of the ImageWriter LQ Color Ribbon, you can use color to highlight reports or presentation graphics. What's more, with the addition of the ImageWriter AppleTalk Option, up to 31 users on an AppleTalk Personal Network can share an ImageWriter LQ, for cost-effective printing.

The AppleFax Modem

A fax modem.

This modem can be your personal link to the worldwide installed base of facsimile machines. Not only does it give you a convenient way to send and receive fax files, it also lets you exchange data files with other Apple Macintosh computers equipped with AppleFax®Modems—at speeds up to four times faster than those offered by standard 2400-baud modems.

AppleShare PC Software

File-server software for PCs and compatibles.

This software lets users of IBM PCs and compatibles share information on an AppleShare™ file server with Macintosh users over the AppleTalk® Personal Network. AppleShare PC software gives an MS-DOS user the same ability to access folders, documents, applications, and storage space as a Macintosh user. Yet using the AppleShare server from an MS-DOS PC is as easy as using a local disk drive.

AppleShare PC is ideally suited to the requirements of the growing community of users who work in a mixed Macintosh/MS-DOS environment. Not only does AppleShare PC let MS-DOS users store applications and files in one convenient location, it also sets the stage for additional resource sharing. The AppleTalk PC Card required with AppleShare PC also makes it possible to print documents that have been created with MS-DOS applications on the Apple LaserWriter printer. With Apple File Exchange and other optional file conversion products, Macintosh and PC users can share documents created under different operating systems. And optional bridges give PC users access to AppleShare servers on other interconnected AppleTalk networks.

System Software Update Version 5.0 with MultiFinder

Apple's first-generation multitasking software.

The Macintosh System Software Update Version 5.0 gives you all the advantages of the latest system software for the Macintosh family of personal computers. It includes the MultiFinder™ operating system, Apple's first-generation multitasking software, which greatly extends the power of the Macintosh.

MultiFinder lets you open multiple applications concurrently. It also allows you to print documents on the Apple LaserWriter printer while you work in another application. In addition, MultiFinder supports an environment in which the computer can perform background communications, calculations, or file processing while you continue work on active "foreground" application. That way, time-consuming tasks don't tie up the computer and keep you from accomplishing other work.

Another major feature of the Macintosh System Software Update Version 5.0 is the Apple File Exchange. With this new utility, you can transfer and translate documents between Macintosh and MS-DOS 5.25-inch disks or ProDOS® 3.5-inch disks. As Apple File Exchange transfers your files, it can translate a document created in one application into the format required by a different application. Apple File Exchange can also translate MS-DOS or ProDOS files transferred to Macintosh disks via a network or communications link.

To further improve Macintosh performance, the Macintosh System Software Update Version 5.0 incorporates many general enhancements, as well as some minor changes that have been made in order to accommodate the new MultiFinder operating system.

Helpful Facts About the SE and the Macintosh II

By Prasad Kaipa
University of Utah

There are several things about the Macintosh II and the Macintosh SE that it is impossible to discover unless you are a regular user of these microcomputers. This article resulted from rather intensive use of both of these new machines.

There are things about the new Macintosh systems that you may not yet have discovered.

For example, if you happen to be near a Macintosh SE that has a programmer's switch installed (on the left side), press the interrupt switch (not the reset switch). You should see an empty box with a > sign. This is not (as you may have suspected) an MS-DOS command mode. Type G 4 and press Return. What you will see are several digitized pictures of the people who created the Macintosh SE and the Macintosh II. It is a self-running demo; your command is dumping the pictures from the ROMs to the screen. To return your machine to normal mode, reboot it or turn it off.

"What's the Difference?" or "What Have the New Machines Got That the Old Ones Didn't?"

The Macintosh SE comes with a built-in fan. Also, you now have several choices concerning the type and number of disk drives that you get. You can select two internal floppy-disk drives or one internal floppy drive and one internal hard disk. Because of the external drive port and the SCSI port that is available on the back of the machine, you can have up to three floppy drives and an external SCSI hard disk; or two floppies and two SCSI drives; or two floppies, one SCSI external hard drive, and an Apple Hard Disk 20, all connected directly to your Macintosh. You should note that Macintosh II does not have the external drive port; therefore, you cannot connect an Apple Hard Disk 20 to the Macintosh II.

The battery is no longer located in the back of the computer. In fact, it is not connected to the power supply at all. It is a seven-year battery that is soldered directly onto the logic board. This raises the question of how to reset the Control Panel when your PRAM is corrupted. With the new 4.1 System and 5.5 Finder, you can open the Control Panel desk accessory with the Shift-Control-Option key combination, and your parameter RAM will be initialized (except for the calendar settings).

The battery is no longer located in the back of the computer.

One signal has been changed on the Macintosh II and the Macintosh SE serial-port mini-DIN-8 connectors. Pin 7, which is not used on the Macintosh Plus, is now a general-purpose input pin. It is connected to the serial communications chip's data carrier detect line on the Macintosh II. Pin 7 on the modem port may also be used as a SYNC line, because it is connected to the clock line from the VIA.

Hard-Disk Interleaving Schemes

The ROMs of the Macintosh Plus SE, and II have different SCSI drive interleaving schemes. This means that though hard disks can be used interchangeably, they will work most efficiently on the system on which they were initialized. The Macintosh SE uses a 2-to-1 interleaving scheme; the Macintosh II uses 1-to-1 interleaving; and the Macintosh Plus uses 3-to-1. Therefore, an SCSI hard disk initialized on a Macintosh Plus and moved to a Macintosh II will not transfer data as quickly as a Macintosh II SCSI drive, because the Macintosh II will be forced to wait for every third block of data, rather than accessing them in sequence.

If a drive initialized on a Macintosh II is connected to a Macintosh Plus, the speed difference will be even more apparent.

If a Macintosh II drive is connected to a Macintosh Plus, the speed difference will be even more apparent. The Macintosh II drive will have blocks allocated in sequence on each track. But the Macintosh Plus will not be able to accept the data as quickly, and the drive will have to make almost a full rotation before the second block again passes under the head, enabling the information to be read from the drive. Similar but less drastic speed differences were seen when drives initialized on Macintosh SE and Macintosh II were interchanged.

Dataframe XP seems to have achieved a better interleaving ratio by providing its own schemes for the Macintosh Plus. No other disk-drive manufacturers seem to really be talking about these schemes yet. If you hear drive manufacturers claiming that their drive utilizes a 1-to-1 scheme, but they don't specify the Macintosh model to which their drive is optimized, you might want to ask a few more questions.

The Macintosh ID number is 7, and the internal SCSI drive number is 0; these cannot be changed.

You can daisy-chain as many as seven SCSI devices to your Macintosh. Each device will have its own unique ID number from 0 to 7. The Macintosh ID number is 7, and the internal SCSI drive number is 0; these cannot be changed. Other drives should be set at numbers from 1 through 6 in terms of increasing priority. The AST 4000 drive has its ID number set at 0 in its ROM, and cannot be changed without explicit instructions from the manufacturer. Until the priority number is changed, it will crash on startup. Rodime drives, which also come set to ID=0, have an easier way to change ID numbers. At the moment, these two manufacturers seem to be the only ones that have set their SCSI drive priority IDs to 0.

If your compatibility problems still persist after changing the ID number, check your SCSI driver. It might be an older one that will not work with the newer Macintosh computers. The workaround to this second problem is simply to update or reinitialize the driver using the Apple HD SC setup.

Keyboards

The new keyboards are low and have a good feel to them. They are not sold as part of the package. If you look closely, you will notice an extra key above the numeric keys. It does not function with the Macintosh SE, but if you connect it to a Macintosh II, it initiates the request for power on (however, pressing the switch when the Macintosh II is on does not turn it off).

Accelerator Boards

If you have a Macintosh Plus or a Macintosh SE and would like to get the sheer power of a Macintosh II, consider a multiprocessing board such as the MI-5 from Mechanical Intelligence. You could also choose to buy an accelerator board. You can get a 68020 processor and a 68881 numeric coprocessor for your Macintosh Plus or Macintosh SE from Radius, Levco, General Computer, Novy systems, and Peak Systems. It is not yet known whether General Computer has a version of the Hypercharger 020 for the Macintosh Plus or whether Novy systems has a board for Macintosh SE.

For added power, you might want to consider a multiprocessing board.

In addition to the 020/881 combination, you can get extra RAM, static RAM cache, or 68851 PMMU, depending on the board you choose. Unless you are planning to work with A/UX or have a need for more than 4 megabytes of memory for the Macintosh SE, you may not need the 851 PMMU. The Radius board has a 32K high-speed zero waitstate static RAM write-through cache that will interrupt both data and instructions. I have not seen the Radius board working, but according to Radius, benchmarks show a vast performance increase. General Computer, Novy, and Radius do not offer 851 PMMU options; Levco and Peak do.

EDUCOM Update

By Steven W. Gilbert
Managing Director, EDUCOM

As we continue to work on the projects and issues, it is becoming somewhat easier to explain the EDUCOM Software Initiative (ESI) to those who ask what we are doing and why. Writing proposals for funding has helped focus our efforts to define this complex enterprise.

The ESI is a conceptual framework—a vision backed by concrete objectives.

- The ESI is a conceptual framework—a vision backed by some concrete objectives.
- It is a forum for communication.
- It consists of a set of working groups and projects.

The ESI is more concerned with the uses of technology—especially for learning and teaching—than with the technology itself. It seeks to involve and serve a diverse constituency of individuals and institutions throughout higher education and computer-related industries.

We provide a forum for discussion among representatives of diverse institutions.

Within the ESI, we have developed (and continue to revise) a way of thinking about software-related issues in higher education and a vision we can work toward. We provide a forum for a continuing discussion among representatives of diverse institutions from higher education and industry, representatives who share concerns about improving the quality, accessibility, and effectiveness of academic software. We try to improve our understanding of the underlying issues while conducting projects that move us in the right direction. We are trying to create an environment that will be more receptive to revolutionary breakthroughs in academic software when they arrive; and, meanwhile, to make worthwhile incremental improvements in the uses of software in higher education right now.

We are working toward the following objectives:

- More focused, institutionally encouraged, software development
- More centrally accessible information
- More effective delivery of software
- More effective pricing

We also want to improve learning. Our work is done, primarily, by active volunteers in coordinated groups. We are proud of our ability to obtain grants and contributions to support more focused projects, as well as our ability to work effectively with institutional partners from both higher education and industry.

Finally, the new issues we will be addressing include:

- Intellectual property rights
- User-support services
- Licenses for using software on networks
- Electronic access to information about software

ESI Brochures Available

The brochure "Using Software—A Guide to the Ethical and Legal Use of Software for Members of the Academic Community" is available in quantity from EDUCOM. This brochure addresses issues concerning the legal and ethical use of software in easy-to-understand language. Pricing for the first printing is as follows:

0–5 copies	No charge
6–500 copies	$.25 each
501–1,000 copies	$.22 each
Over 1,000 copies	$.18 each

To order, please complete the form below and return it to Lynn Cuskley, EDUCOM, 777 Alexander Road, P.O. Box 364, Princeton, NJ 08540.

Order Form

Number of copies ordered:
Check enclosed:
Please send invoice:

Ship to:
Name:

Address:

Telephone:

Name of contact person:

Institutions with Active Participants in ESI as of July 1987

ASM
AT&T
Addison-Wesley Publishing Company
Amherst College
Annenberg/CPB Project
Apple Computer, Inc.
Bradley University
Brown University
Bucknell University
CAUSE
Cadwalder, Wickersham & Taft
Calif. State University—Long Beach
Calif. State University—Los Angeles
Calif. State University (system office)
Carnegie-Mellon University

Control Data Corporation
Dalhousie University
Data General Corporation
Digital Equipment Corporation
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Scholastech, Inc.
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Stanford University
Stevens Institute of Technology
Sun Microsystems, Inc.
Syracuse University (main campus)
T H E Journal
The Chronicle of Higher Education
The WATCOM Group Inc.
United States Army

United States Naval Academy
University of California at Berkeley
University of California at Los Angeles
University of Chicago
University of Delaware
University of Houston—Clear Lake
University of Iowa
University of Louisville
University of Massachusetts—Boston
University of Michigan—Ann Arbor
University of Minnesota—Twin Cities
University of Missouri—Columbia
University of North Carolina
University of North Carolina—Chapel Hill
University of Oregon
University of Rhode Island
University of Wisconsin—La Crosse
University of Wisconsin—Madison
Western Michigan University

EDUCOM Conference Plans for '87 and '88

The software track for the 1987 EDUCOM Annual Conference, to be held October 27–30 in Los Angeles, is well organized under the guidance of Casey Green of HERI/UCLA. Panels will be presented on the EDUCOM Software Awards Program, New Technologies of Instruction and Research, Results of Recent Research, and Campus Software Development and Support. Special Interest Group sessions are already scheduled on Software Assessment, Hypertext Applications, Software Site Negotiations, Computing in Business Schools, and Research Models for Implementation and Assessment. Many of these events will be led by or include ESI participants. We are currently committed to providing a Software Fair that, at the very least, displays the winners from the first Annual EDUCOM/NCRIPTAL Software Awards Program. We hope that this may be extended.

Planning for next year's conference is already under way.

Planning for the 1988 EDUCOM Annual Conference, to be held October 25–28 in Washington, D.C., is already under way. Jim Moss of the Naval Academy and Steve Gilbert of EDUCOM will be responsible for a Software Track. Let us know if you would like to help.

For more information, contact:
EDUCOM
P.O. Box 364
Princeton, NJ 08540
(609) 520-3340 (main number)
(609) 520-3350 (ESI)

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Wheels for the Mind
Apple Computer, Inc.
P.O. Box 1834
Escondido, CA 92025

Liberal Arts Conference Story Retraction

In the last issue of *Wheels for the Mind*, we described the very successful Liberal Arts Conference recently held at Washington College. This article also suggested that Apple is in the process of selecting a site for the next conference. In fact, Washington College chose to do a Liberal Arts Conference with assistance from the local Apple office. Any 1988 Liberal Arts Conference will probably evolve in a similar way.

Products

StatView II

StatView II brings statistical analysis with mainframe speed and power to your desktop.

Abacus Concepts' StatView II for the Macintosh II is the newest in its family of StatView products for the Macintosh computer. StatView II not only includes all of the features and functionality of StatView 512+, but it also brings statistical analysis with mainframe speed and power to your desktop. It combines all of the drawing and graphing capabilities available from Macintosh presentation software with the functionality of the leading statistics program for the Macintosh. StatView II utilizes the color capabilities of the Macintosh II to let you produce stunning, full-color graphs. It has also been designed to take full advantage of the numeric coprocessor in the Macintosh II, which enables it to perform analyses up to 50 times faster than was previously possible.

The color graphics, drawing tools, and increased speed of the program combine to make an especially powerful application for statistical analysis. StatView II's features include the following:

- Color graphics
  - —Scattergram; bar, pie, and line charts
  - —Histogram, error bar, box plots
  - —Resizable graphs
  - —Control over axis labels and legends
  - —Choice of plotting symbols and size
  - —Selection of point overlap technique
  - —Ability to change axis endpoint and tick-mark positions
  - —Selection of logarithmic, semilog, or normal axes
  - —Use of dashed lines
  - —Simultaneous display of multiple plots
  - —Graphic display of statistical results
  - —Unlimited observations

- Drawing tools
  - —Color assignment to any object on the graph
  - —Text insertion anywhere on graph
  - —Choice of font, size, style, and rotation control for any text
  - —Rectangles, rounded rectangles, circles, lines, and arrows
  - —Choice of line widths, fill patterns, and symbols
  - —Full graphical cut-and-paste to and from other applications

- Speed
  —Calculates 30 to 50 times faster than StatView 512+
  —Runs 5-variable multiple regressions with 1,000 observations in five seconds
  —Handles 20-variable factor analysis in nine seconds
  —Plots 1,000 points in eight seconds

If you own a Macintosh SE, you can take advantage of StatView II's speed—and retain all of its graphics capabilities—by adding a third-party accelerator board.

StatView II will become available December 1. Educational volume pricing and site-licensing arrangements are available.

For more information, contact:
Daniel S. Feldman, Jr.
Abacus Concepts, Inc.
P.O. Box 3086
Berkeley, CA 94703
(415) 540-1949

Assembly-Language Textbook

The manuscript is already in use at several campuses.

D. C. Heath and Company is publishing an introduction to assembly-language programming for college students. The book was written by W. Ford and W. Topp of the University of the Pacific (UOP), and will be available in January. Currently, the manuscript is being used at several campuses, including Baylor University, De Anza College, Emory University, State University of New York at Stony Brook, Boston College, and UOP.

The text focuses on the MC68000 microprocessor and features a detailed discussion of the entire instruction set, including many examples and complete programs. The final chapters cover MC68000 I/O programming, including serial and parallel I/O, timers, exception handling, and interrupts.

Other topics covered include:

- Structured programming constructs in assembly language
- Arithmetic operations, including floating-point routines
- Operations on strings, arrays, linked lists, and trees
- Stack frames, reentrancy, and recursion
- Programming serial and parallel I/O chips and timer chips

A Macintosh assembly-language supplement, by Jack Boudreau of Harvard University, will be included. It features page-by-page explanations of differences for users of the Macintosh computer, and a discussion of the Macintosh programming environment, including graphics and sound. It also contains a library of I/O routines and many example programs (a disk is available from the author).

A Macintosh supplement will be included.

If your campus would like to obtain the manuscript for use in classes, contact:
Karin Ellison, Editor
D. C. Heath and Company
7075 Redwood Blvd., Suite K
Novato, CA 94945
(415) 898-1863

PharmaTutor: FFVFF Zurich, Switzerland

The Fund for Research in Alternatives to Animal Experimentation in Zurich, Switzerland, has developed a program for the Macintosh that allows pharmacology experiments to be conducted using the computer instead of live animals.

PharmaTutor replicates a set of pharmacology lab experiments on live animals or isolated organs. It is a set of highly interactive simulations that effectively utilize the Macintosh interface. PharmaTutor's exercises demonstrate the following:

PharmaTutor replicates a set of pharmacology lab experiments on live animals or isolated organs.

- Dose-effect relationships on a smooth muscle in an organ bath. The influence of competitive and noncompetitive blockers is demonstrated.
- The effects of catecholamines on blood pressure and pulse.
- Mechanisms of neuromuscular signal transmission on an isolated diaphragm.
- The reaction of the circulation on the effects of acetylcholine and a ganglion blocker. Simple pharmacokinetics using different modes of administration: oral, I.V., I.V. bolus, and infusion.

The program is accompanied by a set of written exercises that highlight the most important concepts.

There are three different licenses available:

- Standard license: Entitles one person or institution to use PharmaTutor on a single machine. No copies may be made other than one backup.

- Multi-license: Should be ordered if you plan to run several copies of PharmaTutor on several machines. This license is restricted to use within one company or institution at one site.

- University license: Can only be ordered by universities, schools, or other nonprofit organizations; allows free use and copying for educational purposes within the organization.

All licensees receive free program upgrades, plus information about other teaching programs for the Macintosh during a one-year period. In addition to the above conditions, free copies of PharmaTutor may be made, provided that the recipient of the copy is a university, college, or nonprofit organization and that all accompanying documentation is also copied.

For more information, or to order PharmaTutor, contact:
FFVFF
Biberlinstr. 5
8032 Zurich
Switzerland
(Phone) 01 55 70 70

Practica Musica: Music Fundamentals Course

Practica Musica teaches basic skills of interval, chord, and melody using digitally sampled sounds.

Practica Musica is a comprehensive music training course that enables students to learn basic skills of interval, chord, and melody using digitally sampled sound. The program trains a student in the following key areas of basic musicianship: melodic dictation, ear training for intervals, and harmonic theory.

In Melodic Dictation, students listen to digitally recorded melodies ranging from Bach to Stravinsky. A student then writes out the melody in score notation, either placing the notes directly on the staff or pressing the appropriate keys on the on-screen keyboard. Practica Musica provides the rhythmic values and automatically fills in any needed rests and measure lines. Either the model melody or the student's version can be played at any time.

In Interval Ear Training, the program plays an interval, highlights the first note, and then asks the student both to identify the interval by name and to find its second note on the keyboard. This teaches both ascending and descending intervals.

In the Harmonic Mode, a student can write intervals or chords, and see and hear them instantly identified by name, inversion, and root. The program is capable of describing any interval or chord found in common-practice tonal music.

Besides the plain keyboard, Practica Musica offers an enharmonic keyboard that is accessible through the Options menu. Eight other historical tunings are also available from the menu. A user can change the instrument at any time by clicking the button on the right side of the keyboard.

Eight historical tunings are available from the Options menu.

Practica Musica tracks the user's progress with a game-like scoring system. A certificate of progress can be printed at any time.

A 40-page manual, which not only explains all of the program's features, but also gives an introduction to music theory, is included.

The product is available for $125 and can be ordered directly from Periscope Press. Special discounts are available for educational institutions.

For more information contact:
Larry Kimmett
Periscope Press
P.O. Box 6926
Santa Barbara, CA 93160
800-445-8749 (in California)
800-445-4866 (outside California)

The MacLab System

The MacLab system—developed by the Department of Physiology of the Medical School at the University of Otago, in Dunedin, New Zealand, and described in the last issue of *Wheels for the Mind*—is now being marketed by Catalyss Corporation. Catalyss will also provide full servicing of the hardware and total software support. Educational institutions can purchase the MacLab hardware unit, MacScope software, MacChart software, X-Y recorder, and Fast Fourier Transform for $2,450.

For more information, contact:
Catalyss Corp.
7400 South Tucson Way
Englewood, CO 80112
(303) 799-9955

Writing by Design

The program is structured to facilitate creativity and the free flow of ideas.

Writing by Design is a highly visual brainstorming and planning program that allows writers to generate ideas freely and then to organize these ideas into an analysis tree before they start writing a rough draft. Using graphic representation and hypertext, the program is structured to facilitate creativity and the free flow of ideas, while allowing the writer to establish logical relationships and a clear organizational structure. The program deliberately brings the concept of top-down design from computer programming into the writing process.

Writers are offered a choice of two modes in which to work: free-form or structured design.

- Free-form: Using this mode, writers quickly jot down their ideas in text areas anywhere on the screen. They start with a root concept and progress to associated "satellite" ideas. Connecting lines can be solid, dotted, or hidden. They can even be made directional, by using arrows to indicate various relationships. The result is a graphic representation of the brainstorming process.

- Structured design: In this mode, writers organize their ideas into hierarchical analysis trees and design their documents from the top down. The main concept is divided into logical components, each of which is represented by a rectangular text area. These areas are arranged according to their level of specificity. Branching lines have directional arrows and can be labeled. The program's hypertext capabilities permit the text areas to be expanded in separate windows. The resulting analysis tree can be printed in three forms:
  —Exactly as it looks on the screen, with rectangular text areas and branching directional lines.
  —As a text outline, following the sequential organization specified in the analysis tree.
  —As a series of paragraphs (the hypertext material), each with a distinctive heading (the material in the rectangular area), again, following the sequential organization specified in the analysis tree.

The Writing by Design manual not only gives directions for using the program, but also discusses the writing approaches on which the program was based. These include creative brainstorming; root concepts, satellites, and networks of associations; top-down design; sequential organization and levels of specificity; use of analysis trees; and more.

The program was developed by the CIRCLE Programming Group at the University of California at Santa Barbara: Professor John Doner, CIRCLE coordinator; Dr. Joan P. Mitchell, author; and Donna Blakely, programmer.

For more information, contact:
CIRCLE Programming Group
Phelps 1529
University of California
Santa Barbara, CA 93103
(805) 961-8335

TS Graph Site License for Institutions

The program was written to help in publishing graphical data in a scientific paper.

TS Graph is a very functional scientific graphing program designed and written by Donald E. Trimbur, a Cornell graduate student. It was originally written to help in publishing graphical data in a scientific paper. He has since extensively rewritten the program to add many other graph styles and features, while retaining the program's focus on providing publication-quality graphs for books and scientific journals and its sensitivity to the needs of journal authors. Several of Trimbur's colleagues have published articles in journals with the assistance of TS Graph.

TS Graph works on a Macintosh 512K, 512K Enhanced, Plus, SE, or II, and can take advantage of large-screen monitors. The program comes with an illustrated user manual and reference guide (approximately 35 pages) that describes and demonstrates all of the features. TS Graph works with Switcher and supports both the Apple ImageWriter and PostScript printers such as the LaserWriter and LaserWriter Plus. In fact, on a PostScript printer, TS Graph draws smooth curves for curve-fitting data, rather than the polygons drawn by many other graphing programs. In addition, TS Graph is compatible with other Macintosh programs, so graphs can be cut and pasted into word processing and desktop publishing documents, and data sets can be easily moved into and out of spreadsheet programs.

An evaluation copy of the program (one per institution, please) may be obtained by writing to:
Donald E. Trimbur
Department of Microbiology
318 Stocking Hall
Cornell University
Ithaca, NY 14853
(607) 255-2420

General Terms of the Site License:

1) Trimbur Software will provide the institution with a master copy of the program and one copy of the documentation. The institution will be responsible for the duplication of the disk and documentation for distribution to members of its community. All copies of the program distributed at the site must have an official TS Graph label on the disk. These labels will be sold to the institution at a price of $10 each. Initial orders must be for a minimum of 50 labels and also must be accompanied by a signed copy of the license agreement (available with the evaluation copy). Subsequent orders must be for a minimum of 20 labels. The normal single-copy price of the program with documentation is $49.95.

2) The institution has the right to sell copies of TS Graph to members of the community to recover the costs of producing and selling the package, but may not set the price so as to make a profit. Individuals may make backup copies of the software for their own use but may not give or sell any copies to others.

3) Support will be provided by Trimbur Software to one designated person at the institution. The institution is responsible for the support of end users.

4) Reported bugs will be fixed as soon as possible, and free software updates will be sent as required on a new master disk. Distribution of software updates is the responsibility of the institution. The price of major enhancements to TS Graph will be negotiated between the institution and Trimbur Software.

Passage: A Graphics and Numerical-Analysis Program

FADE IN.

A woman, seated behind a cluttered desk, is typing on a Macintosh computer. The women is not wearing a white lab coat or glasses, does not have a pocket calculator attached to her belt or a dozen pens and mechanical pencils in her pocket, and her hair is not done up in some sort of bun. In other words she looks like a typical scientist. She is an astronomy professor.

A young man, the women's graduate student, enters with his arms full of computer printout. He drops the stack of paper on her desk.

Grad: The first run is done. The mainframe chugged for two hours calculating this stuff.

Prof: Well done. What does it all mean?

Grad: I don't know yet. I still haven't written the graphics software to plot this stuff up. All I've got are numbers...tons of numbers. It's going to take me a couple of weeks to write a program to plot it. I won't even know if the results are right until then.

"All I've got are numbers...tons of numbers."

Prof: Take a look at this new graphics program for the Macintosh. It's called Passage. I think it may help.

Grad: "Passage"? What a stupid name for a plot program. I bet you need to put the data in some special format: you know, numbers with tabs between them or something like that. I bet it can't even read this FORTRAN output.

```
 Standard Solar Model Convection Zone
 R0= 6.967E+10  T0= 5.797E+03
 G0= 2.735E+04  OMEGA= 4.575E-07  DEPTH= 1.924E+10
ILL  RADIUS  X=(0,1)  DENSITY   TEMP   PRESSURE
          DRHDX  ...
  1 6.97E+10 0.00E+00 1.00E+00 6.07E+03 1.66E+05
          1.22E+04 ...
  2 6.92E+10 2.63E-02 3.22E+02 3.43E+04 5.23E+08 3.74E+04
          ...
  3 6.87E+10 5.26E-02 1.65E+03 6.72E+04 5.87E+09 6.50E+04
          ...
  4 6.82E+10 7.89E-02 3.75E+03 1.06E+05 2.15E+10 9.33E+04
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  5 6.76E+10 1.05E-01 6.56E+03 1.44E+05 5.23E+10 1.18E+05
          ...
  6 6.71E+10 1.32E-01 9.95E+03 1.85E+05 1.03E+11 1.38E+05
          ...
etc
```

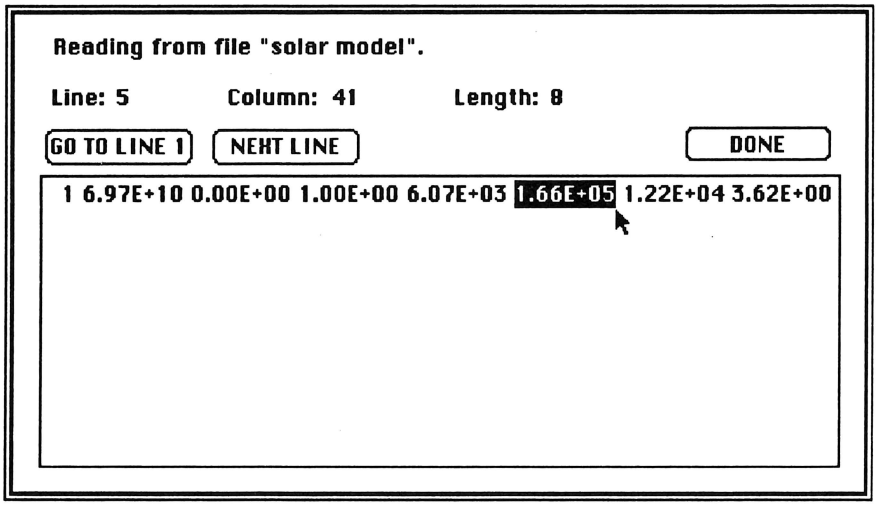
Prof: Yes it can. Here, I'll show you. First we have to download the data.
[They download the data.]
OK, we're all set. Just double-click on the Passage icon.

Grad: That's cute, the way the icon changes from a Feynman diagram to a galaxy when you click on it.

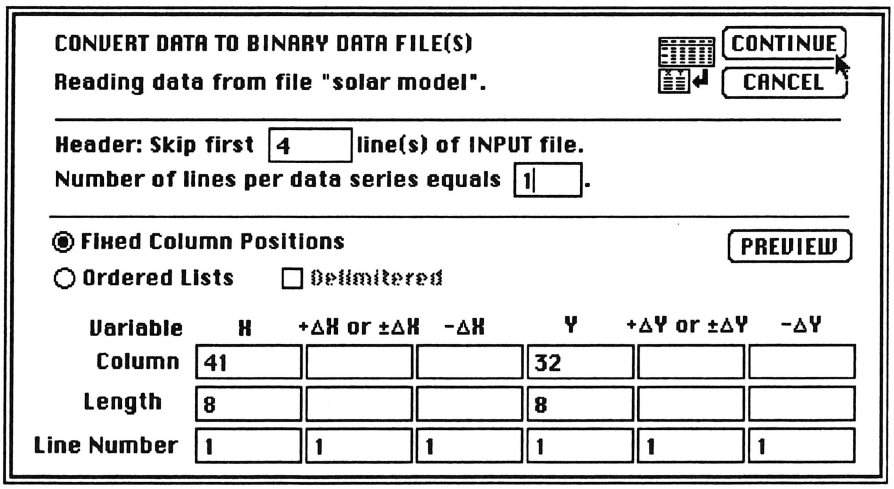
Prof: Yes, the manual says that one of the authors is an astronomer and the other a physicist. Anyway, here we are in Passage. First, we select the Convert Data item...then select the data file. OK, what data do you want to plot?

Grad: How about the temperature versus the pressure. Uh, the file has some header information, you'll want to skip over that.

Prof: No problem. We can preview the file in this dialog box. Yes, there are the four header lines. The pressure data are in columns 41 through 49 and the temperature data are in columns 32 through 40.



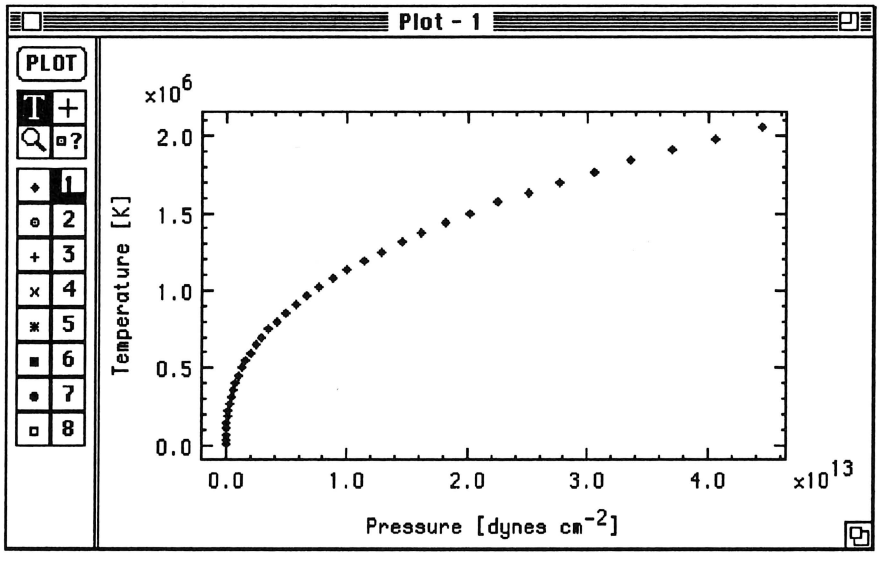
Prof: OK, all I have to do is enter that information in the main dialog box and tell it to do the conversion.



Prof: What do you want to call the converted file?

Grad: How about "P vs. T"?

Prof: Done. Let's read it in and plot it. First we read it in. Notice that we can read in up to eight data files at once ... a real timesaver. Next, we open up a window to plot in, choose a symbol, and add some labels. It can even put superscripts and subscripts in the labels. And finally, we click the Plot button to plot it.

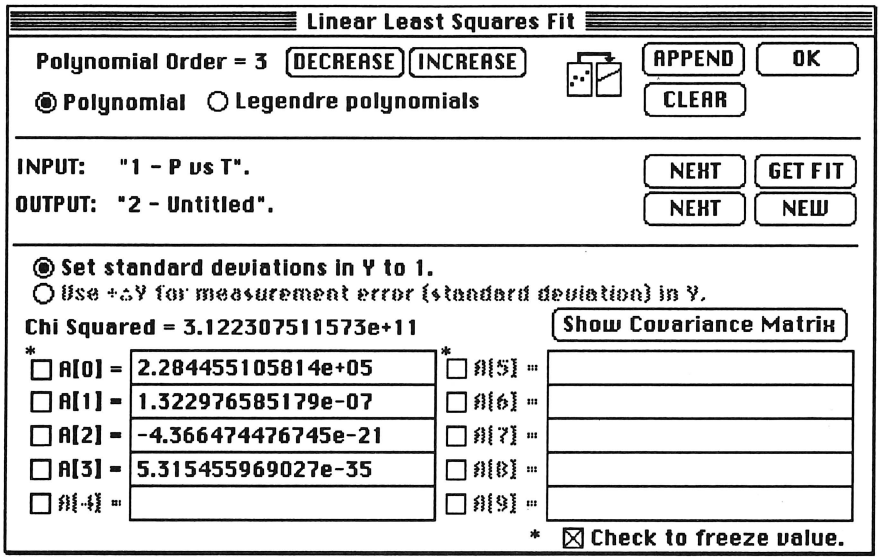


Grad: Very nice. It scales and ticks automatically and seems to be an order of magnitude faster than other Macintosh plotting programs. As Zaphod Beeblebrox would say, "that's amazingly amazing!"

Prof: If we, or this Beeblebrox friend of yours, wanted to, we could annotate the graph, zoom in, up to 10^{12} times, or identify points in the plot.

Grad: Not bad. Can you fit a cubic to the data?

Prof: Easy, all you have to do is ask. Here are the polynomial fitting routines. OK, we want to fit a cubic to the first data set and place the fit in a second data window. I just enter that information here and click on the Get Fit button. There.

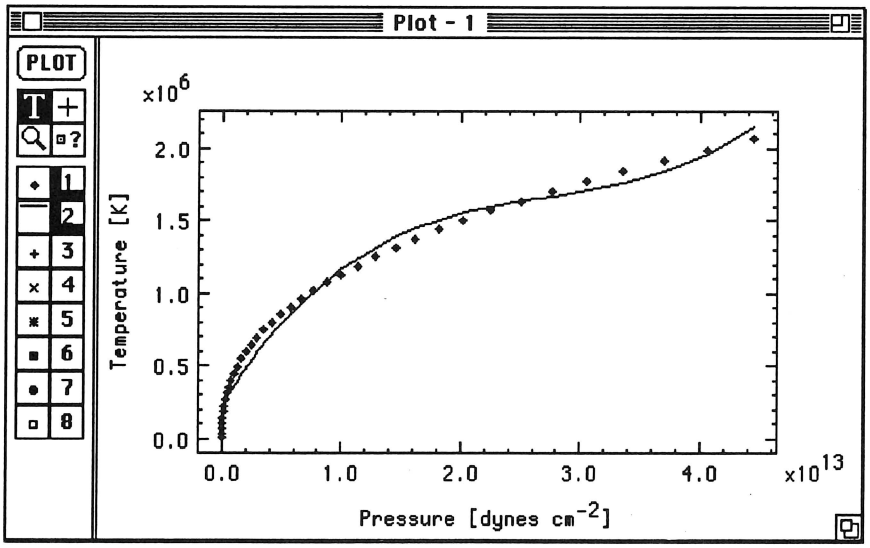


Grad: Here, let me plot it up to see how good the fit is.

Prof: OK, here's the mouse.

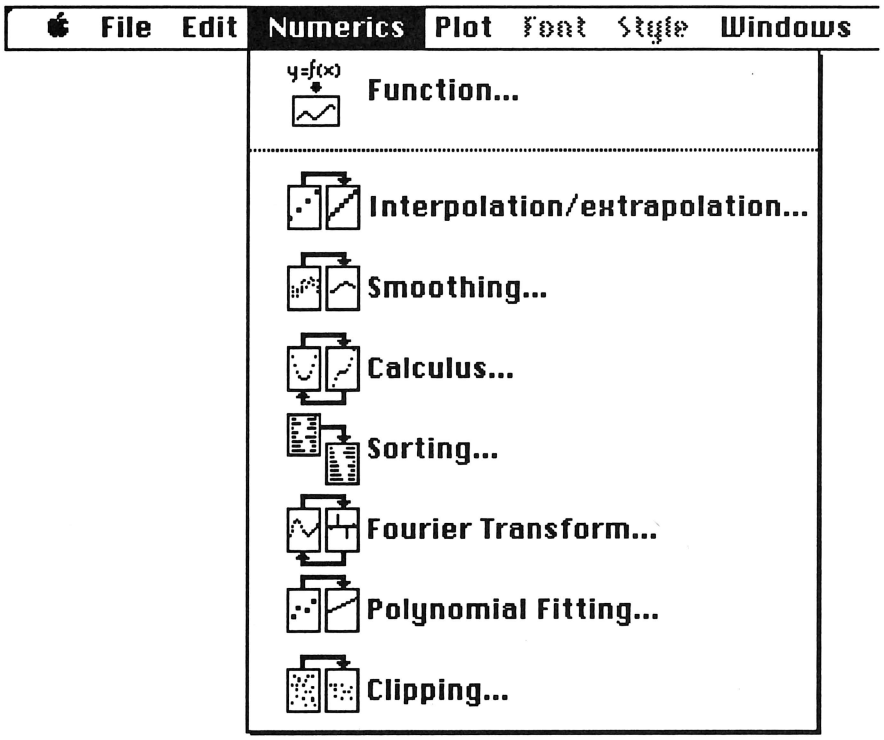
Grad: We have the polynomial fit in the second data window so all I have to do is click on the number two box, right?

Prof: Select a line style: thick, thin, dashed, whatever. By the way, those are real dashed lines—with user-definable dash and space lengths. And now, click the Plot button. And as mother would say, "that's the cat's meow."



Grad: Very curious expression. What else can it do?

Prof: Well, all the numerical routines are listed in this menu.



Grad: What does "Function" do?

Prof: It's a function parser and evaluator.

Grad: What?

Prof: It can take a function like sin(x) + 3*cos(sqrt(x)) and evaluate it so that you can plot it. But more important, it can also be used to manipulate existing data. Here, if I type in **log(y2)-log(y1)**, it will calculate the difference between the logarithm of the polynomial fit and the logarithm of the original data.

Grad: I've tried one of those algebra programs, they're really slow.

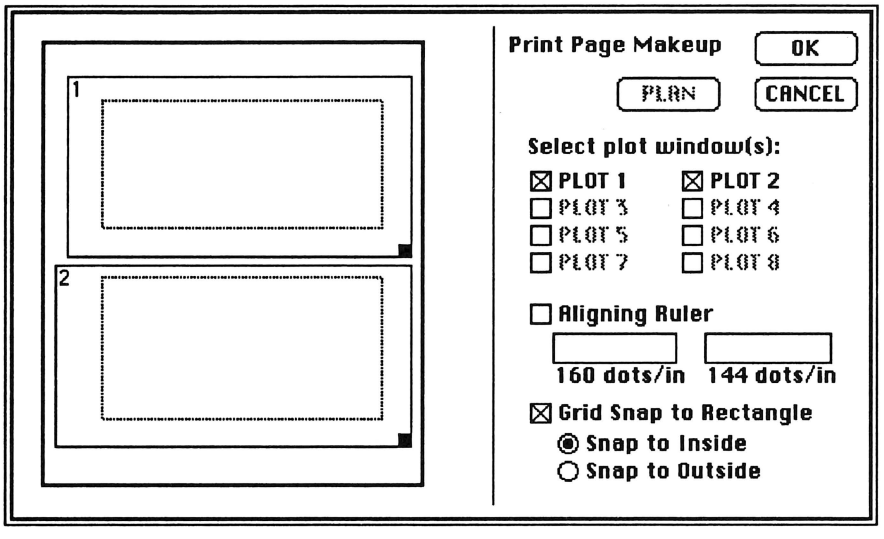
Prof: Let's see.

Grad: OK, go. I'll time it.

Prof: Too late. It's already finished.

Grad: I'm impressed.

Prof: Let's print all this stuff out. We'll put the data and its fit on the top of the page and right underneath it, let's put the logarithmic differences.

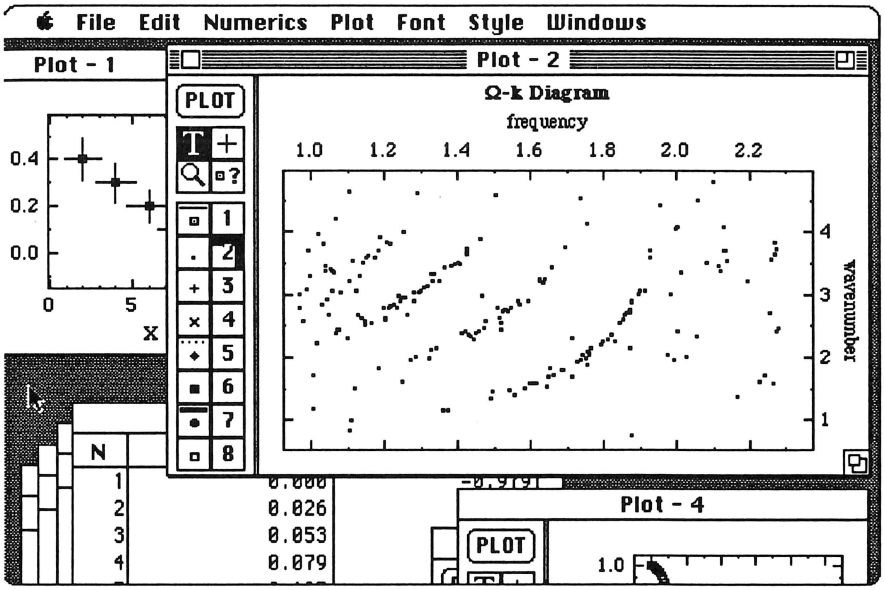


Prof: Now if we wanted to, we could change the thickness of the lines; increase or decrease the lengths of the tick marks; change the size, style, and font type of the labels; and a few other things I forget. OK, it's printing now. What do you think?

Grad: Only ten minutes to produce a graph ready for the journals. It's great.

Prof: Well, these data, unfortunately, are not! What did you do to get this increase in....

FADE OUT.



Passage is a complete graphics and numerical analysis program for the Macintosh that takes you from data input to publication-quality output quickly and effortlessly. Passage can input large amounts of numerical data in a variety of formats; it can quickly scale and plot multiple sets of data, including data with asymmetric error values; it can analyze and manipulate data using routines to calculate integrals, Fourier transforms, polynomial fits, and more; it can evaluate and plot analytically defined functions such as sin(x)+ln(x*cosh(x)/bessj0(x)); and it can produce publication-quality output of multiple plots on a single page using either the ImageWriter or LaserWriter printer.

Passage is fast, scaling and plotting more than a thousand points per minute; it's easy to use, following the Macintosh interface guidelines set forth by Apple; it's flexible, giving you complete control over many aspects of the graph, such as tick lengths and line weights; and best of all, it's inexpensive—only $100.

For more information, contact:
David Guenther
673 Orange Street, Apt. 8
New Haven, CT 06511
(203) 624-3920 (5:00 P.M. to 10:00 P.M. Eastern Time)

Special Interest

This issue, we are offering a **Special Interest** section, subtitled "News from the Netherlands." It consists of three articles by Rick Jansen of SARA (the Academic Computing Centre Amsterdam) at the Universities of Amsterdam. These articles run the gamut: the first, which should be of general interest, is a discussion of transferring Macintosh files (particularly programs) through networks; the second details a product developed at the university that allows users of the TeX formatting language to use a Macintosh to preview their output; and the third explains the technology behind a rather esoteric use of the Macintosh—to product tactile maps that facilitate a blind student's efforts in geography. We hope that you find these accounts of the efforts of Macintosh enthusiasts abroad intriguing.

Transferring Macintosh Files Through Electronic Networks

By Rick Jansen

Introduction

Many of the Apple University Consortium members have access to an electronic network for the exchange of information and mail. But the information exchange these networks enable is not limited to mail; Macintosh documents and software can also be transferred quite easily through these networks. In the last few years, electronic networks have become a major source of public domain software. This article offers an introduction to participating in this exchange. It also explains how you can obtain some utility programs from us that you need to transfer Macintosh files through networks.

Macintosh documents and software can be transferred quite easily through networks.

Networks

A computer network consists of a number of computers interconnected with data communications links—frequently, telephone lines. A user on one machine in the network can send information to another user on another networked machine. You can send mail and data files, or exchange any other information that is transportable through the network.

There are many international networks.

There are many international networks in the world today, including BITNET, ARPAnet, and USENET. These networks serve users all over the world, including the United States, Europe, Japan, and Australia. With some networks, you can send a file from Europe to a user in the United States in just a few minutes.

Files

The type of information transferrable through all networks is plain text, encoded in a standard character set such as ASCII—the way of encoding text that most computers and peripherals today "understand." The advantage of this standard encoding is that information can be exchanged easily between computers and equipment from different manufacturers. This is, of course, essential if you want to exchange information between different machines in different countries without incompatibility problems.

Macintosh Files

Text on the Macintosh is encoded in ASCII; however, Macintosh files are in some aspects quite different from files on other computers. In many cases, there is more to a Macintosh file than just text as on conventional machines, even in simple word processing documents. (Think, for example, of pictures in a MacWrite document and of MacPaint documents.) Also, Macintosh files are often split into two parts: a *data fork* and a mysterious *resource fork*.

Fortunately, there's a way around the incompatibility problem.

Considering all of these oddities, it is hardly surprising to find that it is not so easy to send a Macintosh file through a network to another computer. Fortunately, there's a way around the incompatibility problem. The existing networks are perfectly capable of transferring text. So what could be simpler than to write an application that converts a Macintosh file to a plain text file and can also reverse this process? The resulting text files could then be sent through the network without any trouble.

BinHex

In the early days, there were two programs that were used to perform the conversion of Macintosh file to text file and back: ToHex and FromHex. ToHex converted a Macintosh file to a hexadecimal-coded text file; each byte from the binary Macintosh file was represented in hexadecimal numbers. FromHex reversed the process. These programs were written for the SumacC development system, a Macintosh development system running on a PDP-11. But the resulting binaries then had to be transferred to the Macintosh, which brought up the same file transfer problem. The solution was to turn the binaries into hexadecimal ASCII code, send them to the Macintosh, and decode them there to binary with FromHex.

But coding binary files in hexadecimal is not very efficient, because only 4 bits of information can be stored in one hexadecimal digit. Also, having two separate programs to do conversion was not very convenient. So the next step was to write an application that performed both coding and decoding. A program, BinHex, that did exactly that was written by Yves Lempereur. BinHex version 4.0 is now *the* standard for transferring Macintosh documents and applications as text files through networks. *(Lempereur deserves a great deal of credit for his BinHex program; it has been the key to distributing an enormous amount of public domain software through the networks.)*

The next step was to write an application that performed both coding and decoding.

BinHex uses an efficient coding, packing 6 bits per ASCII character. Even more important is the fact that BinHex also adds a *checksum* to guarantee file transfer integrity. Files sometimes get corrupted during transfers from one machine to another; noise on a telephone line can cause some characters to be deleted or altered. Blindly decoding such a corrupted file back to binary may cause some surprises—such as an application that bombs. With BinHex, when the document or application is coded to text file, a checksum is calculated. The same is done when decoding after the transfer. If the checksum does not match, an error has occurred during transport.

Macintosh files converted with BinHex 4.0 get the file-name extension .HQX. These text files contain printable ASCII characters only, with lines no longer than 64 characters. At the bottom of this page and the top of the next is an example of an .HQX file. This kind of file is transferrable through any network without problems.

An .HQX file

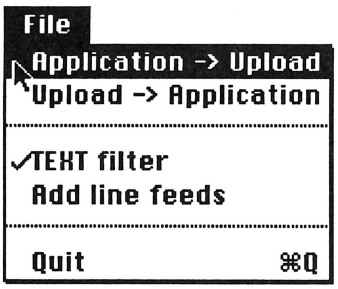
```
(This file must be converted with BinHex 4.0)

:#NePBA0XCA-b,M!!4%C*6%406eB!N!J+GF*%!*!%!3#3!`Sk!!!*1J#3!cX!,!T
+#*3!"dje3HX!'%26BGaK&'(S6R8"-!0*6NB%,3T0C@&cE'9c-Li`E!)!N!0%4NP
-!!!+G3!!#R8!!3#3"%4'58`!!!Te!!!+G3!"!*!$!er1!!$m#!#3"K5)QSYSZ!#
3"JTeF$#`-"!!9XRrqY4Srrj53QX!!+jQ#K#m!$"5390)8N*63V4ZrrjZ!!#DXN*
N!M)#8NK$l[r1%#RrrQF%%[`!,90"8d*U"K,m!#jdIa,B8FRrmM!$Cd)5r!"&3Hl
rkR!!-)0U!R$r)3!a!%KZrr`[#%(Zrq`[#$mm-!ZTkdS3@NKR"!!!#6CN!*!)'J!
U!$`!+J!Z"dePBA0XCA0+U3!8CJT#Cbm*3UG1ZJFkF!"1G6mm!!%[#8+R6VS)R'$
Z51F!L#K*-#J!'J4!!%&Q$$mm!!-[#8+R6VS'M#*-60m4!!JS!!%!"QE%,cJ)r(!
!6R90C@&cE'9c)(CPFR0TEfiJ-Li`)&GbDA4dC@iJ-MN[-6![1$8J3RNJ8QPMDb"
+B@jcC@iJ3#"639*"8d&535`J8#j2,L"#EhJJ0$Ba-b`a-$!j)%&3)%&YFh4PFQ4
KE5`J9'KP)%jPG'KPFQaKEQ4c9'9XCA"SEfjP)#Xc-5db-#de16)c-*!$6PErm%M
R!"JSEJ!))(`!!!R@+9$rZ%)XrlF3,2qh#J!!!8UXrlK@`F!"CcSQE2qi5LX!EQF
D3QG)E2rX)'X!FL"35'J!!NKXrkkSUKPIrlF3,2qh#J!!!@F+)'crZ#PS!*!!rlK
JY%+Xrma#V2r)3Ucra%+Xrm!3,2qhC`!!aNIXrqa"l2rF,8Mrr#"Zrr`aD`!#!!)
JE[rm-*0"l2rB,8Mrq#"ZrrJaD`!'!!)JE[ri-*0"l2r8,8Mrp#"Zrr3aD`!#!!)
JE[rd-+X!"%(Xrp!Y52r`)'lrm$&V!!B!!L"Zrr!`U`!%*QcrZ%*R,bcrh#mV!(+
Sk"!IC`BTE2qirma#CbmXrpJ[+`"bU1J3(fF'+@crZ2r)3QF[,2r8,bX!FUMS%"p
R"LPXrlMra%*R,bcrd#mV!(+Sk"!IC`BTE2qirm"-haJ!6PiZRdje6PErp%MR!4J
q,J!-+'i!##"Xrr`Q8#m,U(-J"qG!5(-!C%KV!G5ST5!(jd""l2rN3r-!C#$C)0N
J"q0!3HX"@MP`!!$ri#!(id""k`'@1A!!!2rL3Hcrl%2Xrq3Jf5$C5'crl$mXrq!
r,2rLU+K"l2rX,8Mrr#"Zrr`[#+K`)'lrr%KS!!5SF%(Xrq3Y52ri)'lrq#m)U(!
JE[ri5'J!"+K`,bi!#%kkrJa+V2r-9X!L,2r-XUcrb&I"`!%L,2r-XUcra&I"`!%
L,2r-XUcr`&I"`!&REL"Xrm`JD!"b)&"$l2rd9)JLf#,B-#crmV"XrrTY$$!Xrq"
```

%3$P!rq"J3$!Xrqk`E2rfEJ",2rJ4%!j32rJB#S`,2r`X'crq'd—#criN4!18$
riQ!8-#crl,"Xrr4Z#M!Xrq*%3$P!rq*J!!,N3Hcrp#*,8)NJf5$C-#crmV"XrrT
Y$M!Xrq"%3$P!rq"J!!,!-#crlV"XrrCZ$M!Xrq"%3$P!rq"J!!+S-#crm,"XrrK
Y$M!Xrq*%3$P!rq*J!!+3!$!Xrr63I!!8X'crl'd1-#criN4!18$riQ!!!R4+V2r
%9X"+V2r!9X(!!@F1-#criN4!18$riQ!!!PC+V2r-9X"+V2r%9X(!!@F1-#cri%4
!18$ri'!!!MK+V2r-9X"+V2r)9X(!!@F1-#criN4!18$riQ!!!KT+V2r)9X"+V2r
!9X(!!@F1-#cri%4!18$ri'!!!Ia+V2r-ChSJE2r-)'J!FL"33qcrp&5))YJLf%T
Xrq"G`%TXrq*H`F!"C"`,2rJ4%!j32rJB%C+E2rJAX"+E2rLAF(!!@F—#criN4
!18$riQ!U-#crq*!!E2rX-LcrqT*Xrqkb3'`—#cri%4!18$ri'!+-#criN4!18$
riQ!!!Aa+V2r)ChSJE2r))'J!FL"33qcrp&5))YJLf%TXrq"H`%TXrq*H`F!"C"
`,2rJ4%!j32rJB%C+E2rJAF"+E2rLAF(!!@F—#criN4!18$riQ!U-#crq*!!E2r
X-LcrmT*XrrDb3'`—#cri%4!18$ri'!+-#criN4!18$riQ!!!2a+V2r%ChJJE2r
%)'J!FL"33qcrp&5))YJLf%TXrq"G`%TXrq*G`F!"C"`,2rJ4%!j32rJB%C+E2r
JAX"+E2rLAX(!!@F—#criN4!18$riQ!U-#crm*!!E2rd-LcrqT*Xrqkb3'`—#c
ri%4!18$ri'!+-#criN4!18$riQ"m5Ucr`'Gf)'cr`#"S!()J8%2Xrr48L#,B)YK
+E2rJAX"+E2rLAF(!!@F—#cri%4!18$ri'"'5Qcri&h!5QcriPl"`!&R$$!Xrq*
%3$P!rq*J+M!Xrr#3!'crp$)Xrr+5E2rfXN"X$$!Xrq"%3$P!rq"J#M!Xrq*%3$P
!rq)J"q0!3HX"@M'Xrq!!!#!(id""k`'@-DcriJ!!,`ZSFd(Xrqa$l2rN)0NJf8K
Xrq`r,2rJ2bcriULS3Hcrl#e)rr3JE[rd,`LSF5"Zrr4)D!!%U(%J"qG!3I-!C%2
Xrq`Jf5$C5'crl%KV!GbST8cI')"1AL"IA%p1d%j@rkj)j`%))'i!$#eS!"6rr#m
Zrra1ZJ)S)'lrr#K3,`bSFb"m!!!+2%2X!G3Lf#,BIJ&J#Mm(,`j1Z[XN8NF-4`!
HEr![,[rm6VS"rNcI%)"1AL"Ih[`!#Nl36PB!!%*RU'%`2(rr5-#"lJ!—Kp)`B2
!28%!$NjH)&pF6dl36PErqNMR!4K#Tbmm!!!"j%kk!CJQAb"Z!!`K5`!8,`Y1ZJ'
H+&-[$+K()(`!!!Sm3q`"e#,B)YK"l!(F,`K)HJ%JU'C)E!"X2c`!"6mm!"ir2!!
*2c`!)ULR1A`!!J&F1A`!!J'B5'`!E%KX!GbSTAi#B!!!d#!(8d$R3#)(jd&"p""
N3r3!C#$C)0NJ"qG!5(3!C%*R2c`!#ULS)!IR3%Kd!'4)E!(FU+8J"q0!,`"#Ccm
m!!3[$Nkkrb)b(b!I3H`"@M'"!!!J"q0!3H`"@NT`!!"Q)#!(id![!%*R2c`!"#m
16VVqpM)I)"p"l!&D-B%!!'$5)!IM3#m!3QFr2!!%,`j1Z[l@-KmJ(d(X!CBaJ3!
!)!IM3%(X!CC+F!!!CL!J"q0!,`"#Ccmm!!3[$NkkrUSb(b!I3H`"PM'"!!"JdP*
($%F!(Qm!rb`[#dkk!(T-haL!6PiJAplm!!T1d""'N"!!6PErr#"Z!!`YD!!8rr`
[,[rm6VS!-%jH)&rHr!!+6Y!LAb!IS%`ZJ%jaF!![#6(!!L"1GA!!B2BLAb!IS5)
ZL%lkrqSLAb"IS#01q[rJ)PmJAk!T6[VreL*I)&qJ+Nlkrm`!!!%!N!-+1J!!#6S
!N!-l!!$-(!!q!*!$(!!b!!"%8PC5!*!$#J!-!*!+#!"0C@&cE'9c&LJ:

BinHex 4.0 is available as public domain program. Its operation is very simple: to convert a Macintosh file to text file, you just choose "Application -> Upload" from the File menu (see figure below). To convert a text file back to a Macintosh file, you choose "Upload -> Application."

BinHex 4.0 File menu



BinHex 4.0 can also decode files from earlier versions of BinHex (such as version 2.0). BinHex 5.0 is the latest version. It converts not to a text file but to a *binary* file, adding the extension .BIN to the file name. However, because not all networks can transfer binary files, BinHex 5.0 is not widely used. Also, BinHex 5.0 is not public domain, but shareware.

Both BinHex programs are available from SARA. (See the Availability of the Software section later in this article.)

Error-Free File Transfers

To prevent errors in file transfer, an error correcting protocol must be used.

Occasionally, when traveling through a network, a file may get corrupted. However, the biggest source of errors is still the *local* file transfer between Macintosh and the network host minicomputer or mainframe. To transfer a file from the Macintosh to the host (or vice versa), you use Macintosh with a terminal-emulation program, such as MacTerminal®, VersaTerm, Kermit, or Red Ryder. Most terminal-emulation programs have a simple file transfer capability called *data logging*, or *save stream*. This means that all lines of text from the host coming over the screen are written to a file on a Macintosh disk. You can simply choose to have the file typed on the screen while saving these lines to disk. This works very well as long as the data communications connections between the Macintosh and your host are of good quality. But if you're using a modem and a telephone to connect to the host, you will find that characters occasionally get corrupted. To prevent errors in the file transfer, an error-correcting protocol must be used.

Kermit

Kermit is a file transfer protocol developed by Frank da Cruz at Columbia University. Kermit's great advantages are that it has been implemented on a very wide range of machines (and is available in the public domain) and that it is almost machine-independent. As long as you can get two computers running Kermit connected in some way, you can transfer files. Kermit does not require fancy data communications facilities; it is, for example, not necessary to be able to do 8-bit data transport.

To transfer files between the Macintosh and the host system, you need a version of Kermit running on each. These two Kermits then "talk" to each other to transfer the file. The sending Kermit sends the file in little "parcels," and adds some extra information (a checksum) to each parcel so that the other Kermit can determine whether the parcel has arrived without errors. The receiving Kermit checks whether the parcel of information arrived correctly and, if not, asks for the parcel to be sent again. This process is repeated until the parcel has arrived correctly. When all parcels have arrived, the file has been transferred.

This article will not discuss how to use Kermit; full documentation is available. (See the Availability of the Software section.)

XModem: MacPut and MacGet

Another protocol, XModem, is used by MacTerminal and VersaTerm, among other programs. As with Kermit, XModem file transfer is performed by a program running on the host and a program running on the microcomputer "talking" to each other. Transfers with XModem are a little faster than with Kermit; however, XModem is not available for such a wide range of hosts, and it demands more data communications facilities. For UNIX systems, the XModem protocol has been implemented with two programs called MacPut and MacGet, for which the source code is available. MacPut sends a file to the Macintosh running MacTerminal or VersaTerm (or another terminal emulator with XModem); MacGet receives a file. MacPut and MacGet were written at Brown University and are available as public domain programs (source code in C, shell archive). Instructions for using MacPut and MacGet can be found in the documentation that comes with the shell archive. (See the Availability of the Software section.)

PackIt

PackIt allows you to "pack" a number of Macintosh files into a single Macintosh file.

PackIt is another program often used for distributing software through networks. Many applications require some accompanying files or documentation, which could mean that you would have to BinHex *each* file, download it to the host, and send it through the network. PackIt, written by Harry Chesley, is a program that allows you to "pack" a number of Macintosh files into a single Macintosh file with the file-name extension .PIT. This definitely increases the efficiency of sending multiple related files, but the PackIt file is still a binary file, so you must convert it with BinHex to transfer it through a network. The "BinHexed" file is then uploaded to the host and sent through the network. The recipient reverses the process: downloading the file, "de-BinHexing" it, and then using PackIt to unpack the original Macintosh files.

As with BinHex, operation of PackIt is quite simple. To unpack files, you simply choose "Unpack Files" from the File menu (see figure below). To pack files, you choose "Pack Files," and the program will prompt you to select the files you wish to pack.

PackIt2 File menu

Sending Software to Another User on a Network

Using the tools described, it is very simple to send Macintosh files to another user. First, the Macintosh file you want to send is converted to a text (.HQX) file with BinHex 4.0. Then the resulting .HQX file is transferred to your networking host machine using Kermit (or with MacGet and the XModem protocol). Next, it is sent through the network by mail (or the appropriate commands for your network). The recipient reverses the process: the .HQX file is transferred to Macintosh with Kermit (or with MacPut and XModem) and converted back to its original Macintosh form with BinHex 4.0.

If you want to send a number of files that belong together, you can begin by using PackIt to group them to be sent as a single Macintosh file, then use BinHex.

Availability of the Software

A number of the programs mentioned are in the public domain, which means that they can be given away and used freely. Others are shareware, which may also be given away freely; however, if you want to keep and use the program, you have to pay the author a small fee. Kermit, BinHex 4.0, and MacPut and MacGet are public domain programs; BinHex 5.0, PackIt2, and Red Ryder are shareware. If you do not have these programs, and you wish to obtain them, you can get them from SARA by sending an empty Macintosh disk to the address mentioned at the end of the article.

A number of the programs mentioned are in the public domain.

Software from Networks

In addition to exchanging software with other users through networks, you can also acquire software on some networks through "servers." For example, ARPAnet has an "info-mac" mailing list. BITNET has a server called "macserve." If you send the command Help to MACSERVE@BITNET, you will be sent all information automatically. (Methods for sending commands to a server vary for the different machines and operating systems; check your local documentation.) You can ask macserve for a list of available software (nearly all of it is in BinHex 4.0 format), and you will be sent the items you request.

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TeX and Macintosh: New Directions in Preview

By Rick Jansen

TeX is D. E. Knuth's state-of-the-art program for typesetting, especially for typesetting mathematical text that includes formulas. TeX is a "conventional" word processor; it reads a normal text file with layout directives and delivers a formatted print file in a special device-independent format, the "DVI file." The input text file is created with a simple text editor. TeX is basically intended for use with typesetters, to produce high-quality publications such as books and magazines.

Because TeX requires a considerable amount of computer power, it is run most frequently on minicomputers or mainframes, though microcomputer implementations are also becoming available. Work on a Macintosh implementation is in progress.

Why Create TeX Preview?

"Debugging" a TeX document can be a rather tedious process.

TeX is certainly not the world's easiest-to-use word processor; in fact, TeX commands are quite error prone, so "debugging" a TeX document can be a rather tedious process. This is especially true if the DVI files are printed with an off-line typesetting machine. At SARA, it can take as much as three days to get a DVI file printed. Clearly, it is very frustrating for the user to spend a lot of time (and money) and end up with output with typing or formatting errors. Previewing documents before actually typesetting them can be very useful, by offering an opportunity to correct errors and to try things out. In other words, it saves you time, money—and a lot of frustration—if you can view the results of your efforts directly after running TeX.

Why Use Macintosh?

To represent pages formatted by TeX with different fonts and styles, you need a device with very powerful graphics. As speed and cost are the main considerations, a graphics terminal and some kind of driver program on the host computer do not suffice; the previewing device itself must have these capabilities. Because Macintosh is a microcomputer with very powerful graphics, different fonts, sizes, styles, and so forth, it was chosen as the TeX Preview facility. In addition, its excellent data communications facilities enable you to easily connect Macintosh to a host computer running TeX. You can use Macintosh as a terminal for editing the TeX input file (with a text editor on the host) and for transferring the DVI file from the host computer to a Macintosh disk for previewing.

TeX Preview

The goal of TeX Preview is not to act as a substitute for a typesetter for printing the final copy. TeX Preview is a tool that you can use to display pages from a DVI file. It lets you do the following:

- Check results directly after running TeX.
- View an entire page.
- View an enlarged part of the page (to examine a formula, for example).
- Check stylistic variations such as italic, bold, and slanted text, as well as mathematical symbols.

Our TeX Preview program is mainly intended for users who work with TeX on a host computer and do not have an on-line printer that is capable of printing TeX output. If your site *does* have an on-line laser printer, for example, it may be possible to use that device for previewing purposes. Even then, however, many users may prefer to be able to check results in their own offices, without having to go to a central printer to fetch output.

Our TeX Preview program is mainly intended for users who work with TeX on a host computer.

Note that TeX Preview is for *viewing* TeX output only—you cannot edit the results. To edit your document, you must use a text editor to modify the input text file.

As with most Macintosh applications, TeX Preview almost operates itself. Because of the consistent and intuitive Macintosh user interface, if you know how to use any other Macintosh program, you will know how to use TeX Preview.

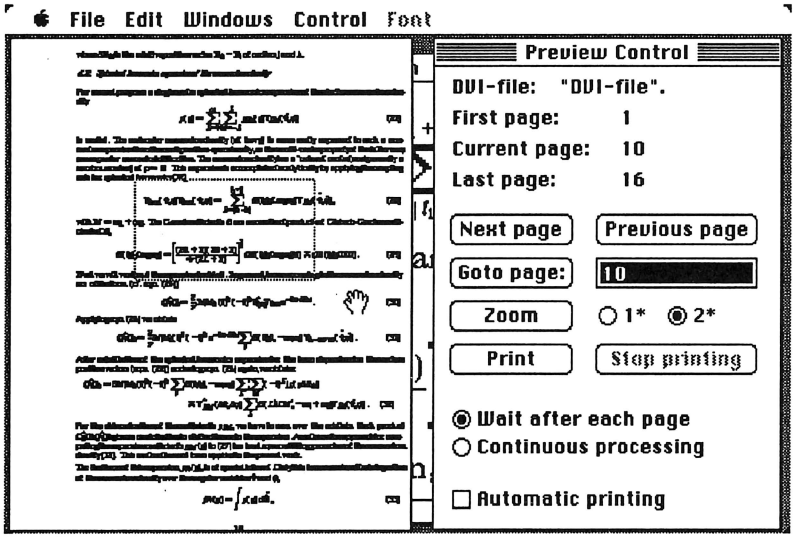
TeX Preview offers three windows for on-screen viewing of pages:

- An Overview window, which lets you view entire pages on the Macintosh screen to get an overall impression of the layout.
- A Zoom window, which lets you view an enlarged section of a page (for example, to check a single formula or paragraph).
- A Preview Control window, from which you can issue commands by using the mouse to press on-screen buttons.

Overview

The Overview window displays the entire page, reduced in size to fit on the screen (see the leftmost window in the figure below).

The Overview window and the Preview Control window



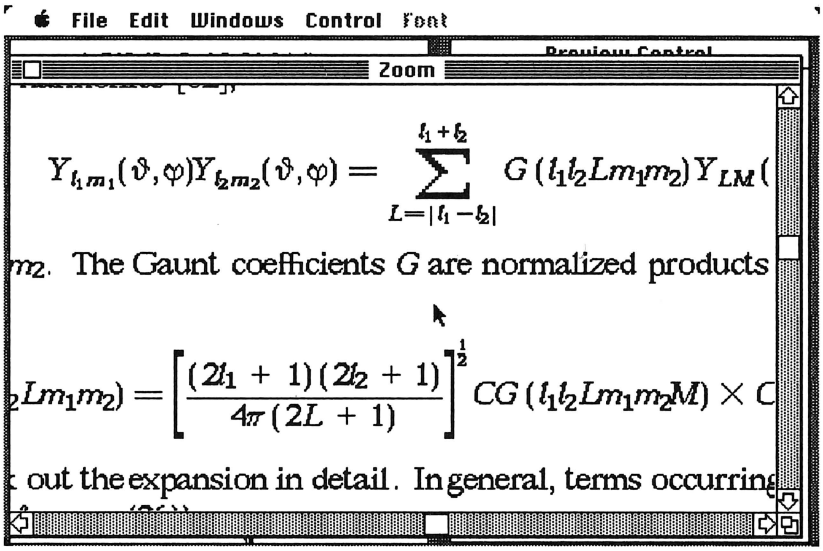
When the mouse is in the Overview window, the cursor changes from the arrow into a hand, and a dotted rectangle appears. You can move this dotted rectangle with the mouse to select an area to be viewed in the Zoom window. (This process may remind you of the Show Page command in MacPaint.)

Preview Control

The Preview Control window, the rightmost window in the figure above, lets you control the operation of TeX Preview. There are buttons for certain commands, and there are other controls to select various options. The window also contains other information—for example, the first, current, and last page number.

Zoom

The Zoom window (see figure below) displays part of the page at its actual size, or at a size twice the actual size. This is useful for close examination of a formula or paragraph. The Zoom window has two scroll bars with which you can scroll the window over the entire page. When you begin using TeX Preview, the Zoom window lies behind the other windows (see figure on the previous page). To view part of the page using the Zoom window, you must move it to the front, as shown in the next figure.



The Zoom window

About Fonts

Typesetters and laser printers print text using their built-in fonts. TeX knows the dimensions of each character within each font for each output device. As these fonts are somewhat different for each device, the DVI file that TeX creates contains *device-dependent* information—or *font-dependent* information, depending on how you look at it. Only the format of the DVI file is device-independent.

The names of the fonts TeX used when formatting the text are stored in the DVI file, so the program that actually prints the DVI file on a typesetter or laser printer knows which fonts to use. This is, of course, also the case for TeX Preview. To be able to generate typesetter-like output, TeX Preview must have access to typesetter-like Macintosh fonts.

TeX Preview reads the DVI file and decides which Macintosh font to substitute for each font used by TeX, using font mapping. You may have to modify the font mapping to get TeX Preview to use the corresponding fonts.

The following fonts are built into TeX Preview:

- cmr-7—a 7-point font that resembles Times Roman
- cmr-10—a 10-point font that resembles Times Roman
- cmti-10—a 10-point font that resembles Times Roman Italic
- cmsy-10—a 10-point mathematical symbol font
- cmmi-10—a 10-point mathematical symbol font
- cmex-10—a 10-point mathematical symbol extension font.

If one of these fonts is requested at another size, the font is scaled.

Printing

Besides viewing pages from the DVI file on screen, you can also print pages with the ImageWriter or LaserWriter printer. Printing is one of the best ways of previewing, because you can view the entire page at its actual size, and at a resolution much higher than that of the screen. The only disadvantage is that printing is much slower than viewing pages on the screen. You can print one page at a time, print the entire DVI file, or specify a range of pages to be printed.

The ImageWriter is the best choice for previewing, because it lets you print all the different fonts just as you see them on the screen.

For previewing DVI files from a TeX-formatted document, the ImageWriter printer is the best choice, because it lets you print all the different fonts just as you see them on the screen. The LaserWriter is less suited for previewing, because you cannot alter the LaserWriter fonts. Also, the LaserWriter fonts—especially the math fonts—have a different layout than the TeX fonts.

Printing with the ImageWriter offers the highest resolution available in a stand-alone Macintosh system. The ImageWriter has a high-resolution mode, of 144 pixels per inch, which is good enough to give you a reasonably good idea of how your document will look. (The Macintosh screen has half this resolution.)

To take full advantage of the LaserWriter printer's capabilities, you will have to give TeX the font definitions of the LaserWriter fonts. For previewing you can, of course, use the LaserWriter, but special symbols such as integrals and summation signs will not be printed correctly without adapting your TeX.

Configuration

TeX Preview will work with Macintosh 128K, 512K, 512K Enhanced, Plus, and XL systems. However, printing with a 128K system is very slow. If you want to print pages, at least 512K of RAM is recommended.

Availability of TeX Preview

TeX Preview is available directly from SARA, at a price of DFl 300 (US$110 at the current exchange rate). It includes one disk and a user's guide. The disk contains the TeX Preview program and some utility programs. With one of these utilities, called TeXSetScrap, you can put Macintosh pictures created with, for example, MacPaint or MacDraw into your TeX document, using *standard* TeX. (No special command is needed.) If you are interested in obtaining the program, please contact SARA.

References

TeX is documented in the following books:

TeX-80:
TeX and METAFONT, New Directions in Typesetting
Donald E. Knuth
Digital Press, Massachusetts, ISBN 0-932376-02-9

TeX-82:
The TeXbook
Donald E. Knuth
Addison-Wesley Publishing Company, ISBN 0-201-13448-9

Macintosh for the Blind: Geographical Map Making and Braille Fonts

By Rick Jansen (SARA) and Dries Jansen (University of Amsterdam)
Amsterdam, The Netherlands

Currently, many blind students attend regular schools. With Braille texts and extra attention from the teacher, this frequently works very well. However, blind students find that participation in standard classroom learning is not as easy with some subjects—for example, geography, in which pictures and maps play such an important role.

In 1984, the faculty at the University of Amsterdam started a project with three blind students.

In 1984, the didactics faculty at the University of Amsterdam started a project with three blind students. For one of these students, maps from the geography book were drawn by hand on A4-sized paper and copied onto swell paper (paper that offers tactile representation of contours). In addition to the problem of the maps, the Braille version of the text was written by hand, which meant that it was a bit irregular. Also, drawing maps and writing Braille by hand was very time-consuming.

To make the process more efficient, we decided to use a computer. The machine had to meet a number of requirements, including the following:

- Good graphics capabilities
- Usable by nontechnical people
- Reasonable price

The requirements made Macintosh a clear candidate.

These requirements made Macintosh a clear candidate. In addition, the unique capability of Macintosh to work with different fonts seemed ideal.

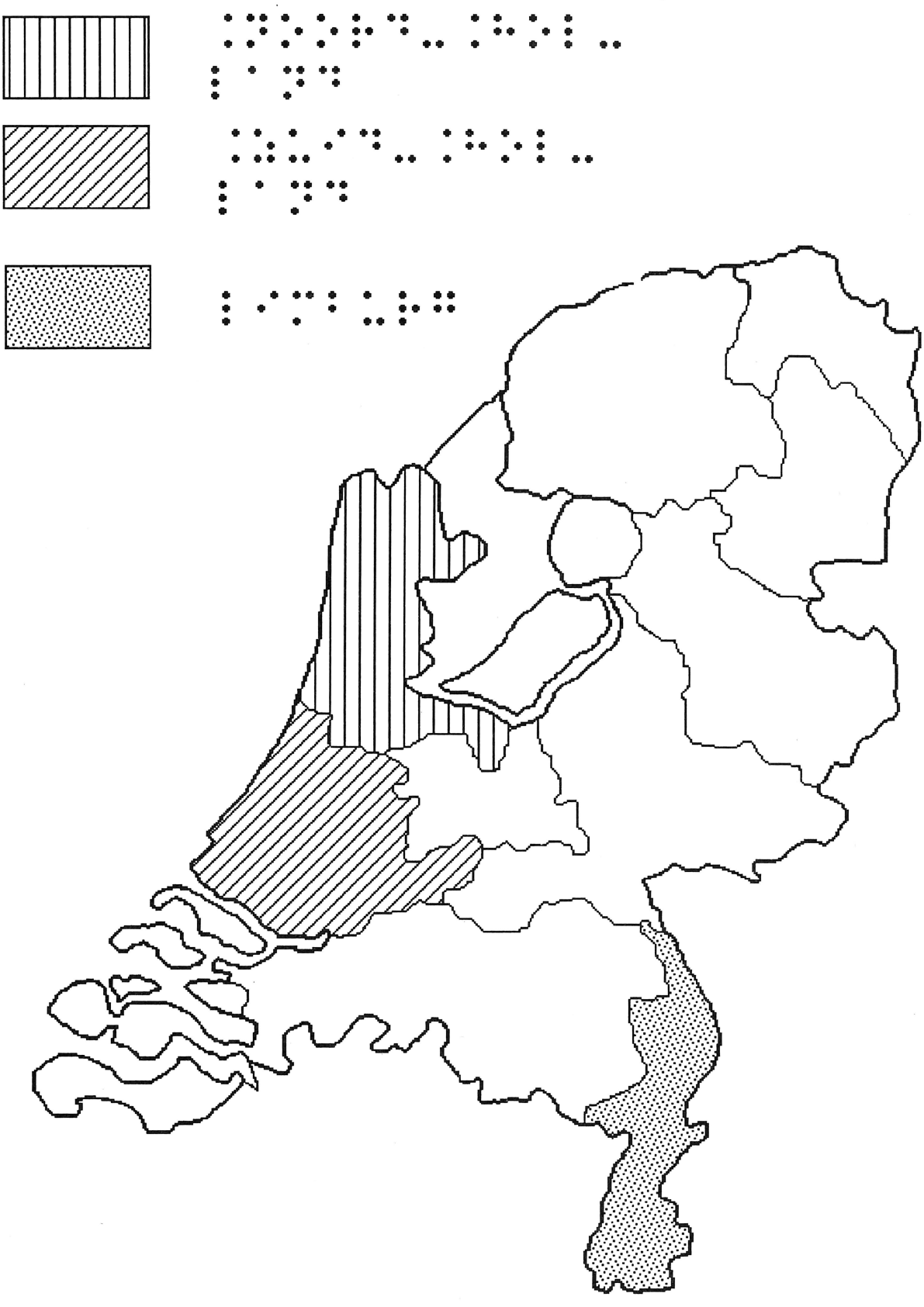
Using the FontEditor, we created a Braille font to be used within the geographical maps. The basic map of Holland was drawn with Macintosh (see the example map on the next page). All further maps were made from this original (master) map. Sighted students can get an impression of a map at a glance, but blind students first have to feel the entire picture with their fingers. This means, for example, that for each map that contains more than one kind of information, several maps have to be drawn for blind students.

The blind geography student needed a little time to get used to the Macintosh patterns that were used for filling in certain areas, but she was very happy immediately with the regularity of the Braille writing. And the entire class used the maps made with the Macintosh for the blind student, which resulted in the blind student feeling more accepted and more involved. With these maps, she could also work independently.

Some Map-Making Hints

- Because blind people have to feel the information with their fingers, the patterns should be fairly coarse, with a surface of at least 1 centimeter squared. Most of the Macintosh patterns are too fine.
- The number of patterns you can use is limited to around six. Also, you should leave an open space between patterns of at least 4 millimeters.
- The quantity of information that can be communicated to blind people through such a map is not overly large. Information that is too complex must be simplified.

The basic map of Holland, with legend in Braille



Using Swell Paper

Swell paper is paper that has a thin chemical layer (coating). When you heat this paper, its chemical coating swells. The paper will swell to a maximum of 2 centimeters, but this is too much for reproduction of pictures and Braille texts. (The best height is 2 millimeters.) Swell paper can be obtained from Minolta and also from the Swedish National Institute for the Blind.

After you have drawn your Macintosh picture on the swell paper, the next step is to heat the paper briefly and equally. The easiest—and actually the most efficient—way is to print directly on the swell paper with the ImageWriter, and just heat the paper in a fuser. After the swell paper is heated, the black lines and dots of the painting will rise a little. You can heat the swell paper in three ways:

- In a fuser (for example, a Gestetner compact OE-1 fuser)
- In some copying machines (for example, Rank Xerox 3400)
- In an offset-plate machine (for example, Gestetner 100 PM)

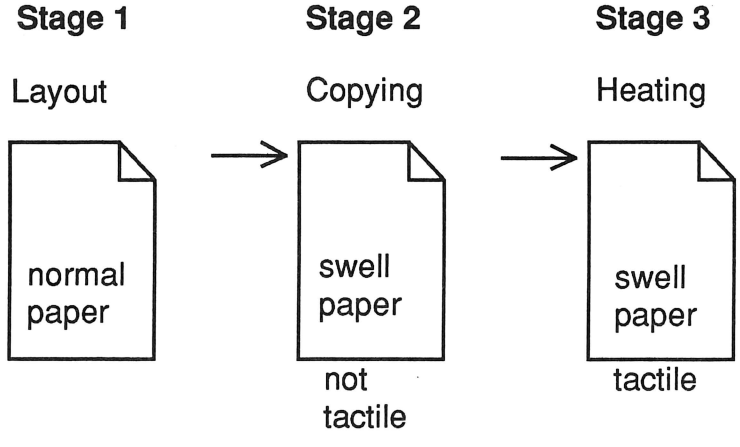
Note that not every copying machine or offset-plate machine is suitable for making copies on swell paper. (It is also possible to draw directly on the swell paper with special pencils.)

The Map-Making Process

1. You produce the picture or text on your Macintosh.

2. You directly print or copy your layout on swell paper. (Copying can be done with a copying machine or offset-plate machine.)

3. You produce the tactile representation by heating the swell paper in a fuser.



Braille Fonts

To be able to label the pictures with text, we created a Macintosh Braille font. The characters of the complete alphabet are created with the FontEditor and stored under the standard keys (shifted and unshifted). The symbols of the shorthand Braille are stored under the Option keys (shifted and unshifted).

Because not everybody can read Braille, we also made a standard alphabetic font (called VBraille, or Visual Braille) with the same font size as the Macintosh Braille font. This means that you can type your text in a normal font, then design your layout using VBraille, and, finally, change the text to Braille.

We use the Braille font mainly to label pictures with text, but it could also be used to create texts with MacWrite or Microsoft Word, or for converting existing texts to Braille. By using the Font menu, you can convert normal text to Braille and vice versa.

	a	b	c	d	e	f	g	h	i
VBraille.eng	a	b	c	d	e	f	g	h	i
Braille.eng	⠁	⠃	⠉	⠙	⠑	⠋	⠛	⠓	⠊

	j	k	l	m	n	o	p	q	r
VBraille.eng	j	k	l	m	n	o	p	q	r
Braille.eng	⠚	⠅	⠇	⠍	⠝	⠕	⠏	⠟	⠗

	s	t	u	v	w	x	y	z
VBraille.eng	s	t	u	v	w	x	y	z
Braille.eng	⠎	⠞	⠥	⠧	⠺	⠭	⠽	⠵

	0	1	2	3	4
VBraille.eng	0	1	2	3	4
Braille.eng	⠚	⠁	⠃	⠉	⠙

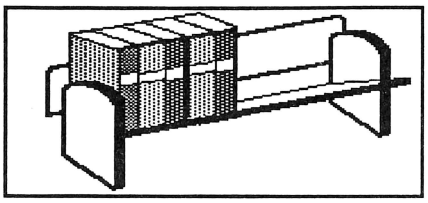
	5	6	7	8	9
VBraille.eng	5	6	7	8	9
Braille.eng	⠑	⠋	⠛	⠓	⠊

	ç	é	à	è	ò	ù	â
VBraille.eng	ç	é	à	è	ò	ù	â
Braille.eng	⠯	⠿	⠷	⠮	⠪	⠻	⠡

	ê	î	ô	û
VBraille.eng	ê	î	ô	û
Braille.eng	⠣	⠩	⠹	⠱

	ä	ë	ï	ö	ü
VBraille.eng	ä	ë	ï	ö	ü
Braille.eng	⠜	⠫	⠯	⠬	⠳

Resources



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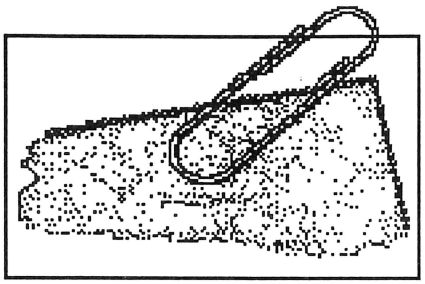
Project Reports



This section of *Wheels for the Mind* presents many of the projects that are being developed at various colleges and universities. The listings are not restricted to Consortium schools or to schools in this country; you will find projects that are being done at universities all over the world.

Some of the items listed here are just in the beginning stages, while others are completed and ready for distribution. New listings are indicated by an apple (🍎) next to their heading.

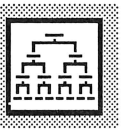
Wherever possible, we have tried to list an appropriate contact, in case you are interested in finding out more about a particular listing.

One of the original intents of organizing educational institutions around the Macintosh was to provide opportunities for creative people to share their expertise and talents. We are sure that you will find much of that creativity in evidence here.

Please feel free to collaborate on developing an application, to develop one on your own, or simply to use one that was developed by one of your colleagues.

Most important, let us know what YOU are working on. Perhaps there are others around the world who might like to work with you! Send us a description of your project.

Business Administration



The Macintosh is being used in several courses and a development project at the Sloan School of Management, the business school at the Massachusetts Institute of Technology. In 1985, Sloan received a grant from Apple Computer, Inc. that led to the development of course software in Systems Dynamics and Decision Models. A later grant enabled the creation of a Macintosh laboratory within the East Campus Computer Facility, where Sloan's computing facilities are housed. Several Macintosh computers were also distributed among other faculty, engendering a general desire to integrate the Macintosh into their courses.

🍎 Decision Tree Analysis

Business Administration

Decision Tree Analysis cont.

In 1986, a matching grant from the National Science Foundation and Apple enabled the initiation of a multiyear project to develop Macintosh software for decision modeling, optimization, and mathematical programming applications.

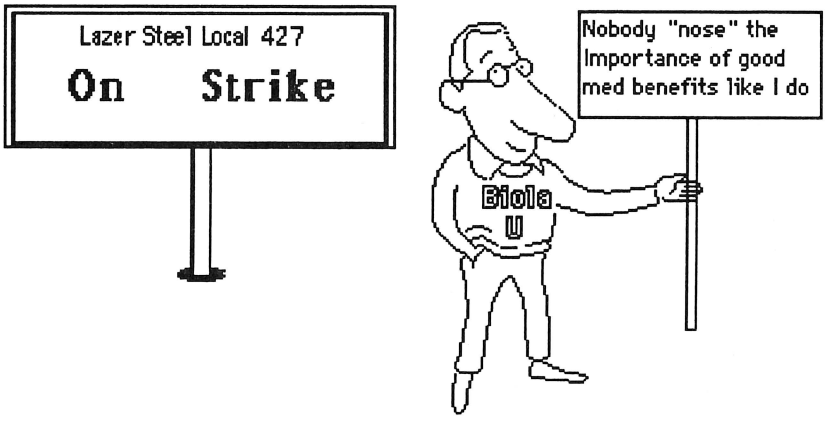
Several faculty members in the management science department at Sloan are involved in a long-term project to create a library of tools that will support them in the classroom and in their ongoing research related to scheduling and vehicle-routing problems. One faculty member, James Orlin, is leading the development of Macintosh software for decision tree analysis. Several student programmers are currently working on a part-time basis to bring the advantages of the Macintosh computer's superior graphical interface to this decision-modeling application.

The goals of this particular project are to go beyond the capabilities of existing decision analysis packages, especially in the area of sensitivity analysis. There is also a related interest in the representation of network flow algorithms on Macintosh. If the project is successful, the software will be used in the classroom to teach undergraduate, master's, and Ph.D. students the use of computers in decision tree analysis, which is covered in the Decision Models for Management course.

Current status: Ongoing.
Contact: James Orlin, Associate Professor of Management Science, Sloan School of Management, 50 Memorial Drive, E53-357, Cambridge, MA 02139

Master Negotiator

The Macintosh is now the microcomputer of choice institutionwide at Biola University in La Mirada, California. This fall, the Department of Business Administration—the largest undergraduate program at the university—will be using a program called Master Negotiator to teach negotiation skills to business students.



Business Administration

Master Negotiator was designed by Larry Linamen, the department chairman, using the Course Builder authoring program. Students attempt to outnegotiate their computer counterpart in situations that include an irate employee demanding a raise, a negotiation concerning stock buy-out prices, and the events surrounding a potential union strike. The program randomly selects computer-generated responses, so that students will not neccessarily get the same responses on their second, third, or even fourth time through the program. It makes use of animation, digitized voice, and sound, as it combines hands-on experience, sound negotiating principles, and a touch of humor.

Current status: Probable completion in December 1987.
Contact: Dr. Larry Linamen, Department of Business Administration, Biola University, La Mirada, CA 90639

Chemistry

Huckel Molecular Orbitals

The program, Huckel Molecular Orbital (HMO), calculates energy eigenvalues, eigenvectors, pi-electron charge densities, and pi-electron bond orders for conjugated and aromatic molecules using the assumptions of simple HMO theory. Each of these parameters is useful for some chemical purpose: to predict sites of electrophilic and nucleophilic attack; to estimate bond strengths and bond lengths; to predict sites of free radical attack; or to estimate oxidation and reduction potentials. A Resonance Structure window is used to enter the resonance structure of the molecule. The Resonance Structure window has a grid of hexagonally spaced dots marking the locations where atoms and bonds can be entered. Along the left side of the window is a MacDraw-like palette that allows the user to select the type of atom or bond to be entered. A resonance structure and its secular matrix can be edited and saved. The results (resonance structure, secular matrix, energy eigenvalues, eigenvectors, charge densities, charges, and bonds orders) can be viewed in a Results window and printed. Printing can be directed to an ImageWriter, LaserWriter, or AppleTalk ImageWriter printer. The application can be used by anyone who can draw the resonance structure of a molecule. System requirements: Macintosh computer, minimum 512K of RAM.

Current status: Version 2.1 complete. Available for $12 (current price) from Kinko's Academic Courseware Exchange.
Contact: John J. Farrell, Chemistry or Harry H. Haddon, Academic Computing, Franklin & Marshall College, Lancaster, PA 17604

Computer Science

InForm

InForm builds cross-reference lists and abstracts of Pascal programs and reformats sources to a standard form. In contrast to Apple's PasMat, InForm does not suppose that your program is syntactically correct. It supports all usual Pascal compilers.

Current status: Version 2.0 completed.
Contact: Günther Sawitzki, StatLab, Im Neuenheimer Feld 294, D 6900 Heidelberg, West Germany

Template

Template is another extendable Pascal program for the Macintosh. It uses a layered design to help Macintosh novices make the steps from "classical" programs to event-driven programming. Template includes a collection of about 50 subroutines, which are commonly used to provide a Macintosh-like user interface. Public domain.

Current status: Version 2.0 completed.
Contact: Günther Sawitzki, StatLab, Im Neuenheimer Feld 294, D 6900 Heidelberg, West Germany

Education

CourseMaker

Developed at the University of Nebraska, CourseMaker is an authoring system for the Macintosh. It is not intended to compete with high-end authoring systems, but rather to provide an easy-to-use, inexpensive, yet powerful alternative. Any instructor who can use the Macintosh for word processing should be able to master the program in less than half an hour.

CourseMaker lets users design screens with any number of windows and buttons. Once made, any element may be edited or deleted. Windows may be used to display text or graphics, or as blanks for student input. The screen sequence is determined by dragging the pointer from a button (for example, "Next") to the appropriate screen. All operations are controlled either through menus or by clicking and dragging. CourseMaker presents two views: one for working on the design of a particular screen; the other an expanded view showing all the screens, which is used for sequencing.

CourseMaker cont.

Using CourseMaker, a complete freshman composition course has been developed. The course sets problem-solving tasks, provides general and specific aids to invention, encourages revision based on reconsideration of and reflection on what other students have written, provides models of student writing, exercises, journal-writing topics, and more. It seeks to encourage fluency, awareness of the writing process, and the ability to use writing as a means of learning, all in the atmosphere of a workshop.

Current status: Beta testing.
Contact: Steve Boyd or Gerry Brookes, English, University of Nebraska, Lincoln, NE 68588-0333; AppleLink: U0128

Engineering

Computer Graphics Course

A junior-level computer graphics course, suitable for electrical and computer engineers, is being developed with two basic assumptions: that computer graphics is best understood if the student writes programs to interactively generate pictures; and that the principles of the subject will be learned more easily if the student first becomes familiar with a current graphics system, and then learns the current graphics standards. The Macintosh computer, with its acclaimed graphical user interface and its set of QuickDraw graphics procedures, is a natural choice for the system to learn first. The usual graphics standards are discussed after this, usually toward the end of the course.

Current status: Notes, about 70 percent complete, are currently in revision. For a copy of the latest set, write the contact below.
Contact: T. J. Wagner, Department of Electrical and Computer Engineering, University of Texas, Austin, TX 78712

Root Locus Program

One of the techniques used to analyze the stability of a closed-loop control system is to plot its root locus, the set of roots of the system's characteristic polynomial as the open-loop gain is varied. A Macintosh program has been completed that enables the user to obtain an arbitrarily close approximation to the root locus. The program is easy to use, follows the usual Macintosh

Engineering

Root Locus Program

graphical interface, and affords students studying the root locus technique an opportunity to check their approximations with the root locus generated by the program. This program should be of interest to all undergraduate engineering students studying control theory. For a disk containing this program and a similar program dealing with Bode Analysis, write the contact given below.

Current status: Completed.
Contact: T. J. Wagner, Department of Electrical and Computer Engineering, University of Texas, Austin, TX 78712

Bode Analysis Program

This program provides a magnitude and phase plot for a linear system with a rational transfer function. For a disk containing this program and a similar program dealing with Root Locus Analysis, write the contact given below.

Current status: Completed.
Contact: T. J. Wagner, Department of Electrical and Computer Engineering, University of Texas, Austin, TX 78712

Chemical Engineering Projects

A program to model heat transfer in a human finger has been written in Microsoft BASIC (2.0 or 2.1) for a graduate course in biomedical engineering. The program considers the decrease in blood flow toward the end of the finger and also accounts for countercurrent transfer between arteries and veins. At the end of the finger, the series-parallel model of Mitchell and Myers (*Biophys. J.* 8:897, 1968) is used.

Current status: Preliminary version finished, but further development ongoing.

A program in Microsoft BASIC (2.0 or 2.1) models the clearance of barbiturate from the body using an artificial kidney. The program, written for a graduate course in biomedical engineering, considers the body in a four-compartment model with blood and tissue subcompartments in equilibrium as described by Dedrick and Bischoff (*Chem. Eng. Prog. Symp. Ser.* 64:32, 1968). Transfer equations are solved using a fourth-order-Runga-Kutta algorithm.

Current status: Preliminary version finished, but further development ongoing.

Chemical Engineering Projects cont.

A simple function-plotting program has been written in Microsoft BASIC (2.0 or 2.1) to plot any function provided in a subroutine. The program makes use of windows, buttons, and pull-down menus to allow easy selection of the plot features. The resulting plot can be reproduced on the ImageWriter with full-page resolution or can be transferred to other graphics programs (such as MacDraw) for further enhancement.

Current status: Completed.

Several programs are being developed in Microsoft BASIC (2.0 or 2.1) to fit a set of x-y data to linear, quadratic, cubic, or exponential functions to a curve and plot the data and/or the fit. The programs make use of windows, buttons, and pull-down menus to allow easy selection of the plot features. The resulting plots can be reproduced on the ImageWriter with full-page resolution or can be transferred to other graphics programs (such as MacDraw) for further enhancement.

Current status: Completed.
Contact: Ken Solen, Chemical Engineering, 350-G CB, Brigham Young University, Provo, UT 84604; (801) 378-6237

MacHEATRAN

During the last three semesters, mechanical engineering students have developed a user/tutorial package for the Macintosh. (It works best on computers with at least 512K of memory.) The software, called MacHEATRAN, is designed for use in conjunction with any common heat-transfer textbook. The mechanical engineering department has made a Macintosh lab available to students using MacHEATRAN. The programs are menu driven and include the following subjects:

- Introduction to conduction, convection, and radiation as covered in the first chapter of many texts.
- Steady-state conduction through composite walls (all three coordinate systems).
- Fins, called "extended surfaces" in most texts.
- Conduction shape factors for 24 shapes.
- Convection heat-transfer coefficient and friction in duct flow.
- Convection heat-transfer coefficients for flow across single tubes and tube bundles, including pressure drop across tube bundles.

Mechanical Engineering

MacHEATRAN cont.

- Free convection, external, and enclosed flows.
- Radiation configuration factor.
- Flat-plate heat-transfer coefficient and boundary layer thickness for both free and forced convection and both laminar and turbulent flow.
- Heat exchangers, using a combination of LMTD and the effectiveness-NTU method.
- The electrical resistance network method (Oppenheim's) for solving radiation problems for net heat transfer between two, three, or four surfaces, where the geometry and surface properties are known.
- Lump capacity system analysis where up to six lumps represent the problem. Any of the lumps can be connected to a constant temperature source or a constant temperature sink. A heat source can drive any or all of the lumps.
- Uniform heat generation for steady state (all three common coordinate systems).
- A lumped capacity program set up just to solve the same type of problems solved by the Heisler charts (again, all three coordinate systems).
- A linking portion of a program is set up so the user can add an application program called TRY YOUR SKILL to the MacHEATRAN disk.

Some fluid properties are included in the software and can be called automatically by the name of the fluid. The program is in Microsoft BASIC 2.0. This software is designed for the beginning heat transfer student or as a refresher for the rusty student. It is a tutorial disk, but is also appropriate for the person who does an occasional heat-transfer estimate in engineering work. Experts in heat transfer will probably find this program too simple. With user's manual, the package is available for $95. Site licences are available for $295.

Current status: Completed.
Contact: Richard Ulrich, Mechanical Engineering, 242-J CB, Brigham Young University, Provo, UT 84604; (801) 378-6542

Foreign Languages

The International Fonts

The International Fonts support word processing in hundreds of languages. They consist of four fonts: International Roman, Greek, Cyrillic, and Phonetic. They enable typing in all Western European languages and many more besides. The Roman font has four dozen diacritical signs (which may be used above uppercase letters) and extra characters; the Greek supports both the classical and modern languages; the Cyrillic supports more than a dozen languages, including prerevolutionary Russian; the Phonetic is based on the IPA.

Current status: Completed. For a disk of all four fonts and instruction manuals, please send U.S. $21.75 ($22.75 outside North America) for use on up to three machines; other prices on request.
Contact: Prof. Paul Rapoport, 7 Cradock Court, Ancaster, Ontario L9G 3Z5, Canada

The Private Tutor System

The Private Tutor System enables teachers to convert exercises quickly and easily from foreign language textbooks into a format (including graphics) that will run on the Macintosh. Students can receive question-by-question tutoring, analysis of errors, and various other helpful information. The system automatically keeps track of the student's progress and creates a review exercise upon demand. The teacher can also use the system to perform an error analysis of the student's answers. The Private Tutor System has been successfully tested by students at Yale University. It was written by Stephen Clausing, Assistant Professor, German Department, Yale University.

Current status: Completed and in use.
Contact: Stephen Clausing, 408 Thoreau Road, Branford, CT 06405

Math and Statistics

Cantor Function Laboratory

This is a limited computer laboratory that allows a beginning calculus student to experiment with certain mathematical functions that are concretely presented, but for which it is too time-consuming to study their properties using hand calculation. The laboratory performs the basic calculations and graphs the results, allowing students to concentrate on the implications of the examples. A workbook (in preparation) suggests helpful lines of questioning and experiments.

Math and Statistics

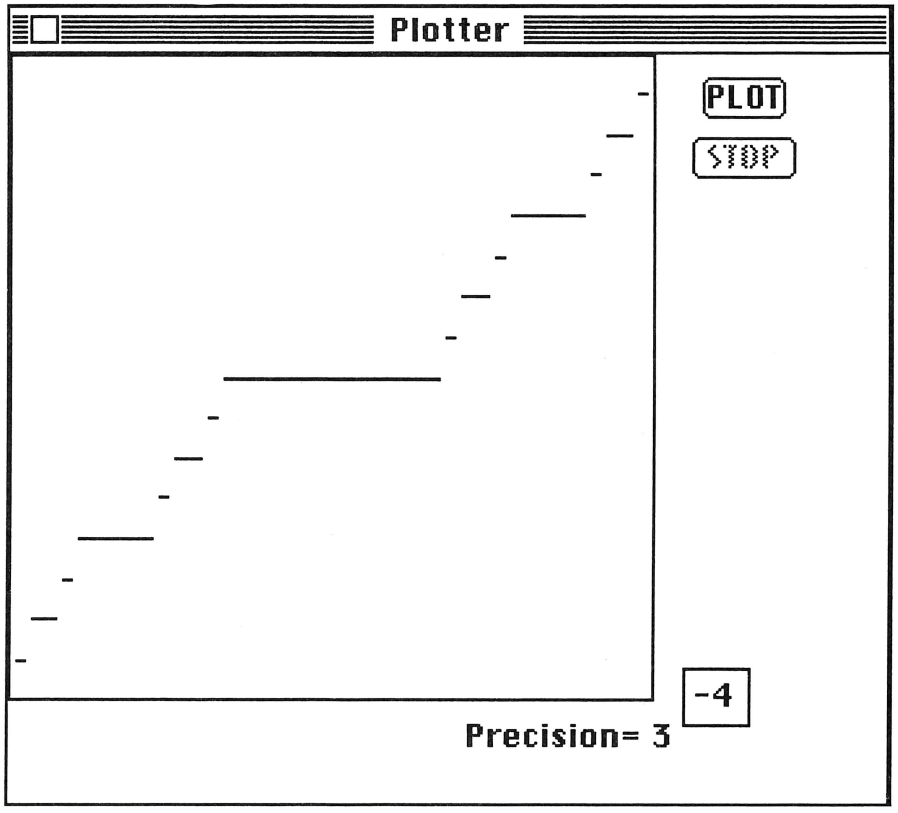
Cantor Function Laboratory cont.

The Cantor function is an example of a continuous function that cannot be defined by a formula. Its derivative is 0 almost everywhere, yet it is not constant (definitely a mind-expanding continuous function). With this example in mind, it is easier to see why the Intermediate Value Thereom and other "facts" about continuous functions are not obvious, but require careful investigation.

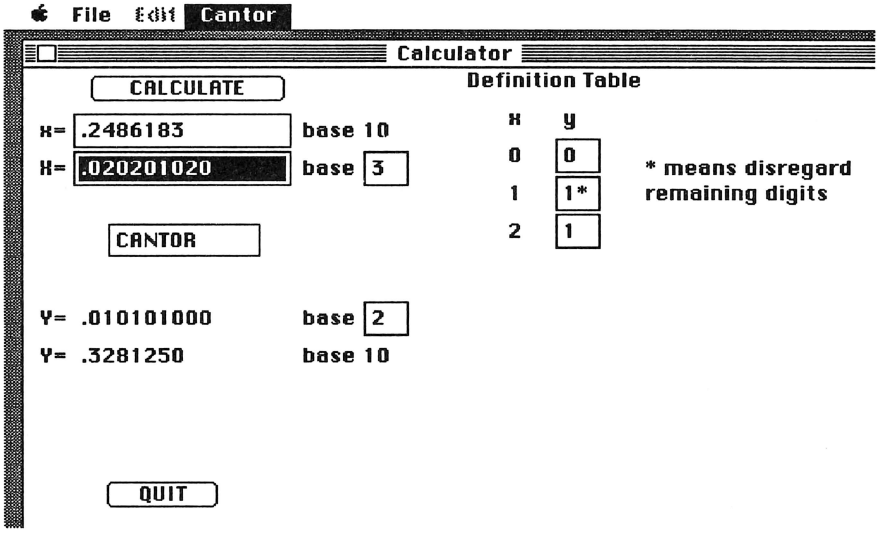
The Cantor laboratory makes it easy to convert numbers from one base to another, to calculate the function output for a given input once the user has specified the replacement procedure to be used, and to graph the resulting functions. This allows a student to proceed experimentally as well as theoretically in answering questions such as those posed earlier.

In a second edition, we hope to allow replacement procedures defined by a quite general finite state automata. This will allow the concrete definition and representation of such exotica as space filling curves and functions that are continuous everywhere and differentiable nowhere.

The Cantor function at stage 4



Cantor Function Laboratory cont.



The calculator section of the Cantor function laboratory

Current status: The laboratory calculates and graphs generalized Cantor functions well and quickly. A workbook suggesting mathematical questions to investigate using the laboratory is in preparation. Efforts are being made to make operating the laboratory operate as easy as possible.
Contact: Michael Gage, Department of Mathematics, University of Rochester, Rochester, NY 14627

X-Graph

We are currently working on an expandable graphics program to be used in a differential equations computer lab. The program will perform various methods of numerical integration to assist the students in learning and understanding their advantages and shortcomings. This program will have a function parser to evaluate standard algebraic functions.

The program will be written to act as an expandable graphics application. Instructors will be able to write routines in C (and maybe Pascal) to compute data and have these routines called from within this graphics program. As data is computed, it is made available to other routines to compute additional data.

Current status: Under development; expected beta test in December.
Contact: Larry Landry, Computing Center, University of Rochester, Rochester, NY 14627

Math and Statistics

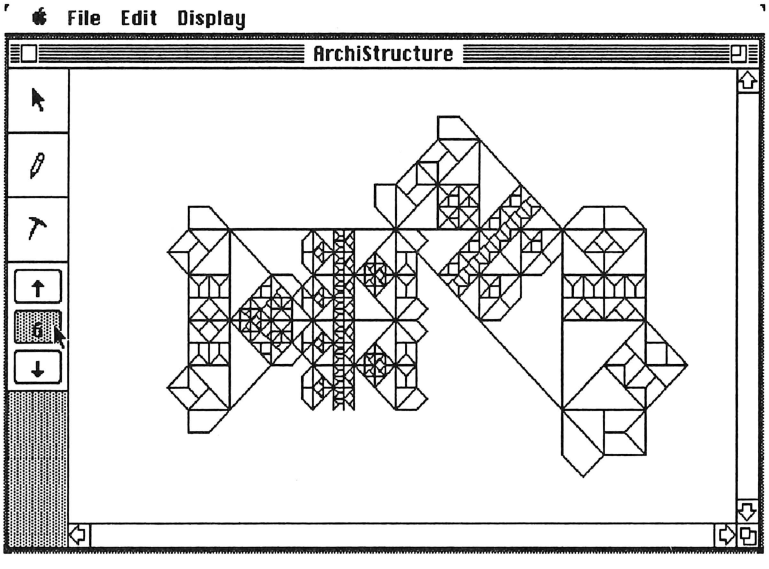
An Introduction to Limits and Continuity

This program is an introduction to limits and continuity, suitable for beginning calculus students. The program is menu-driven with 13 separate modules. Seven modules discuss limits and six discuss continuity. The types of limits included are of the form: A/B where B≠ 0, A/O where A ≠ 0,0/0, A/∞ and ∞/∞. The continuity modules discuss missing point, finite, and infinite discontinuities, as well as vertical and horizontal asymptotes. Each module includes examples with accompanying graphs and problems to solve. Included also is a quiz on the limit modules and one on the continuity module.

Current status: A complete version of the program in DAL is running on our VAX system. The Macintosh version will be completed by spring 1988.
Contact: Dr. David G. Beane, Professor of Mathematics, Mathematical Sciences, The College of Wooster, 2436 Monterey Street, Wooster, OH 44691; (216) 263-2389

MetaForm

MetaForm is a design tool for exploring the realm of self-similar forms. Trees, tesselations, textures, symmetries, space-filling curves, shorelines, phylotaxis, and spirals are all examples of self-similar phenomena that are conveniently handled by the program. The user creates motifs and transformations by drawing and dragging. These are nested repeatedly to generate forms of intriguing visual complexity. Modest changes to the original motif ripple throughout the entire structure, often producing startling results.



Current status: A prototype of MetaForm is in use; a distribution version is now available.
Contact: Chris Carlson, Center for Art and Technology, Carnegie-Mellon University, College of Fine Arts, Rm 111, Pittsburgh, PA 15213, (412) 268-3454

Math and Statistics

Statistical Subroutines

The Statistical Laboratory of the Universität Heidelberg is building a public domain library of statistical subroutines. The library comprises classical algorithms (adapted to use the full range of IEEE arithmetics) as well as algorithms from recent research and classroom demonstration programs. All programs are written in Pascal. The full source is in the public domain.
Current status: Ongoing.
Contact: Günther Sawitzki, StatLab, Im Neuenheimer Feld 294, D 6900 Heidelberg, West Germany

Ternary Plot

Ternary plots are triangular diagrams that graphically depict a three-component system. Each side of the triangle represents a two-component system. Ternary plots are used extensively in the earth sciences for graphical classification and analysis of chemical and mineralogical composition of rocks. Any three-component system may be represented, for example, composition, shape, texture.

Ternary Plot will normalize and plot three values on an equilateral triangle. Triangles of two sizes of are available. A plot title and apex labels can be entered. Multiple data sets can be plotted on the same diagram using a variety of different symbols. Grids and tie lines can be drawn with line-plotting and line-drawing tools. A freehand drawing tool can be used to encircle groups of data, and an eraser is provided to remove mistakes or even bad data points. Grids (or any graphic) drawn in a MacPaint-type format can be copied to the Clipboard, then subsequently transferred into any other application or pasted into the Scrapbook. Various grids or data plots can be kept in the Scrapbook for future use. Several predrawn grids are provided in the Scrapbook in the System Folder on this disk.

Ternary Plot is shareware. You may freely distribute it to anyone. But please keep this document and the Scrapbook together with the application. Plotting ternary diagrams by hand can be tedious and very time-consuming. If you must display your data on a triangular diagram, Ternary Plot will generate professional-looking Macintosh output in a small fraction of the time it would take to plot the data by hand. If Ternary Plot has saved you time or money and you received it via modem or a friend, please send $15. Send $20 for a disk with the most recent versions of Ternary Plot, Scrapbook, and documentation, as well as a hard-copy version of the documentation. For a fee, I will customize the graphical output, scaling of the axes, mathematical conversions, or any part of this program.

Current status: Completed.
Contact: Pierre A. Zippi, 60 Mountview Ave. #410, Toronto, Ontario M6P 2L4, Canada; (416) 766-4077, morning hours

Medicine and Nursing

Model Neuron

This program simulates the behavior of a Hodgkin-Huxley model neuron interactively, using a laboratory metaphor in its user interface. The user has control of electrical stimuli (current injection or voltage clamp) and chemical stimuli (acetylcholine and/or GABA). The proportion of various membrane channel types and the concentrations of K+, Na+, and Cl- ions inside and outside the cell may be changed by the user, as well. Several neurotoxins may be applied to the cell, together or separately. The program should be of use to students of neurobiology, biopsychology, and medical physiology.

Current status: Completed and in use in an introductory neurobiology course. The program will be revised based on feedback.
Contact: Barry Polley, E503 MVR—Dept. D&EA, Cornell University, Ithaca, NY 14853

Iliad and Odyssey

The Department of Medical Informatics at the University of Utah is using the Macintosh to develop a package of tools designed to help clerkship-level medical students manage medical information resources and learn good decision-making skills. The package consists of several concurrently developed projects, two of which are Iliad and Odyssey.

Iliad is a Macintosh subset of the HELP (Health Evaluation through Logical Processing) Hospital Information System. As a teaching tool, Iliad allows clinicians and students to interactively record a patient's medical findings on the terminal. Iliad then runs various decision-making subprograms ("frames") against initial findings and generates specific patient and physician-directed questions. After obtaining answers to these questions, Iliad generates a list of suggested differential diagnoses.

Odyssey provides a common, easily used front end to search several selected data bases. This program uses a concept of hierarchically connected "relations" of medical concepts. Relations allow Odyssey to accept common English terms, yet perform powerful searches. Two data bases are currently implemented on the Odyssey system. The first is a clinically relevant, expert-filtered subset of the medical literature constructed especially for students. The other is composed of teaching models of decision-making strategies from the HELP mainframe system. Access to other data bases, such as a hypertext book of internal medicine is planned. Both programs are available to students and staff via Macintosh computers placed in medical wards at the University of Utah Hospital.

Current status: Ongoing.
Contact: Dr. Homer Warner or Curtis L. Anderson, Department of Medical Informatics, AB193 Medical Center, University of Utah, Salt Lake City, UT 84112

Medicine and Nursing

EKG Project

Randy Ostler and Joe Barrus, seniors in electrical engineering, have built a general-purpose serial interface with software that makes the Macintosh capable of reading analog as well as parallel signals. The hardware consists of a general-purpose serial interface device to which specialized add-ons can be connected. For example, the current project is an EKG device that will provide an economical way for a doctor to view a patient's electrocardiogram. Instead of purchasing specialized electrocardiograph hardware, a doctor can purchase a Macintosh with the required add-on hardware, and use the Macintosh for other purposes (such as bookkeeping, billing, and scheduling) as well as patient monitoring. The EKG leads connect to an add-on device (also designed by Randy Ostler and Joe Barrus) with analog circuitry that amplifies the signal for the general-purpose interface. The EKG information is then passed through the serial port of the Macintosh. Analog data coming from the EKG leads is displayed on the Macintosh screen in real time. The software will be capable of performing basic signal processing to filter out unwanted frequencies. Further enhancements will include oscilloscope and logic analysis applications.

Current status: Completed.
Contact: Randy Ostler and Joe Barrus, 417 CB, Brigham Young University, Provo, UT 84604, (801) 378-3812

Antimicrobial Agents

This HFS data base contains more than 100 chemical structures of current and developmental antimicrobial agents. Each structure is easily transferred to MacWrite, Microsoft Word or other program documents for use in laboratory manuals, textual material, and the like.

Current status: Version 1.1 completed.
Contact: Prof. James T. Griffith, Corsair MicroGraphics Project, Department of Medical Technology, Southeastern Massachusetts University, North Dartmouth, MA 02747; (617) 999-8329

Review of Human Physiological Defense Mechanisms

Faculty of the University of Utah College of Nursing are developing a computer-assisted instruction tutorial for the review of content pertaining to the immune, inflammatory, and coagulation systems.

Current status: In development.
Contact: Beryl M. Peters or Sandra H. Haak, College of Nursing, University of Utah, 25 South Medical Drive, Salt Lake City, UT 84112

Miscellaneous

Dialectical Notebook and Peer Network Project

Think of a writing exercise that you would like to engage your students in. Think of a way to describe that exercise so that each student can be guided through a collaborative process. Think of a program to send that exercise description to each student's Macintosh and to manage the collaborative process and to preserve the group's work.

Add a team of teachers from all academic divisions of the college exploring how to use electronic dialogue to engage students in learnings in humanities, fine arts, national systems, and social sciences.

Imagine more than 500 students reading, writing, thinking—"talking" to each other electronically and in person in Basic Inquiry, a core course taken by all first-year students at Lewis & Clark. That's what's happening at Lewis & Clark College this fall.

Current status: Ongoing.
Contacts: John Miller, Academic Computing, and Susan Kirschner, Core Curriculum, Lewis & Clark College, Portland, OR

MacChoro

MacChoro is a computer mapping, data classification, and map-design program to produce choropleth maps. The choropleth method, which uses shadings to represent values, is one of the most common methods of statistical mapping. The program includes four common methods of data classification: standard deviation, equal-interval, quantile, and natural breaks, plus a user-defined option. Each may be displayed with between 2 and 16 classes. Since polygon data are kept in memory, maps are updated quickly, allowing the user to view the data with a variety of classification options. MacChoro also incorporates data manipulation capabilities. Data may be modified through division, multiplication, subtraction, addition of/by another data set or a constant. Logarithm and square root transformation of data also are possible. MacChoro is intended as a tool for geographical data analysis, creating maps for publication, and evaluating the different methods of data classification. Presently available maps include: United States by state and county, Canada by province, North America by country, South America by country, Europe by country, Africa by country, Asia by country, and the world by country. A separate program, polyEXTRACT, creates map files of U.S. counties from a data base of 32,865 coordinates and 3,980 polygons. Both programs require at least 512K; polyEXTRACT requires an 800K drive.

Current status: Completed.
Contact: Michael Peterson, Department of Geography/Geology, University of Nebraska at Omaha, Omaha, NE 69182

Miscellaneous

Image Analysis System

An Image Analysis System has been developed based on the Macintosh computer. In addition to the computer, it consists of a microscope, video camera, 25mm lens, monitor (necessary for focusing), Switcher, New Image Magic hardware and software, and an Image Analysis program that does the calculations. Exclusive of the cost of the Macintosh and microscope, the system can be put together using quality components for less than $1,000.

The program is designed for the serious research investigator who needs an inexpensive method of quantitating the stereological features captured on video images. Basically, MacPaint files of video images of the specimens to be analyzed are saved using the black-and-white option of the Magic program. Transfer to Image Analyzer is made using Switcher; the file is opened and the image is edited and processed. The present version will determine area, perimeter, and chord numbers of full screen, variable rectangles, and irregularly shaped areas circumscribed freehand. Editing features include fill, inversion, framing, and smoothing. A routine is provided for making outline drawings that can be input as data for three-dimensional image analysis. Three sizes each of black-and-white erasers are available. Provision is made for entering magnification factors. The option of saving edited images as MacPaint files is also provided.

The system has been used with transmitted and reflected microscopic images as well as photographs placed on copy stands. Editing accuracy is improved by using a digitizing pad. Available from KSS Computer Engineers, 3048 South Breeze Drive, Magna, UT 84044.

Current status: Completed. For a disk with program and manual, please send $100.
Contact: Gerry H. Kenner, Ph.D., Systems Analyst, TL Laboratory, Building 351, University of Utah Medical Center, Salt Lake City, UT 84112

Stereology Program

Program written for use with MacTablet and any other digitizing tablet that inputs into the mouse storage registers. Area, perimeter, number, and/or widths are determined of structures traced using the cursor. A structure-counting routine is also provided. Sixteen features can be quantitated for each view of a specimen. Provision is made for entering magnification factors.

Special features include an edit box for recording observations made while making measurements and an option for storing tracings as MacPaint files. Data is saved in text format for easy transfer to statistical, spreadsheet, or data-base programs. Available from KSS Computer Engineers, 3048 South Breeze Drive, Magna, UT 84044.

Current status: Completed. For a disk with program and manual, please send $100.
Contact: Gerry H. Kenner, Ph.D., Systems Analyst, TL Laboratory, Building 351, University of Utah Medical Center, Salt Lake City, UT 84112

Miscellaneous

Joystick Rotation

A program for using a joystick for manual tracking of circular clockwise and counterclockwise movement of experimental animals or devices, with manual and timed termination of data collection cycle. Output (screen and disk) includes sequential pattern of movements, number of full turns CW and CCW, and some statistics relating to these values. Editing is allowed during data collection (backspacing) and analysis (insertion and deletion). Available from KSS Computer Engineers, 3048 South Breeze Drive, Magna, UT 84044.

Current status: Completed. For a disk with program and manual, please send $100.
Contact: Gerry H. Kenner, Ph.D., Systems Analyst, TL Laboratory, Building 351, University of Utah Medical Center, Salt Lake City, UT 84112

AppleTalk Protocols for UNIX BSD 4.2

Columbia University has implemented a portion of Apple Computer's AppleTalk protocols for UNIX® BSD 4.2 and Ultrix. CAP routines are structured, for the most part, the same as the Apple routines described in *Inside AppleTalk* and *Inside LaserWriter*. A version of an AppleTalk Filing Protocol UNIX FileServer (AUFS) has also been developed. A UNIX® machine running BSD 4.2 may provide network services to AppleTalk networks, including file and print services. Use of this software requires an AppleTalk/Ethernet bridge, such as Kinetics FastPath.

This software allows you to use AppleShare file-server software without a dedicated Macintosh computer. Presently, Columbia has two gigabytes of accessible memory for the campus on a VAX via this method.

Current status: Available now. There is no charge, however, it may NOT be incorporated into a commercial product or a product developed for sale.
Contact: Rob Cartolano, User Services, 612 W. 115th St., New York, NY 10025

Miscellaneous

Fluid Power Symbols

These are MacPaint templates of the symbols used to draw hydraulic and pneumatic power and control circuits. The symbols in the templates are, in nearly all instances, identical to those found in the relevant ANSI and ISO standards. The standards that the various symbols are from and the degree to which each set is completed are listed below:

Current status:

Conventional ANSI symbols, Y32.10	98% completed
ANSI ladder (detached Symbols), B93.38	70% completed
ANSI logic (attached Symbols), B93.38	90% completed
Conventional ISO symbols, 1219	40% completed
ISO logic symbols, DP 5784	100% completed

Contact: David Pilichowski, Mott Community College, 1401 E. Court St., Flint, MI 48502; (313) 762-0500; GEnie Address: DPilichowski

Music

Appletones

Appletones is used in introductory music composition courses. It is a tool that teaches the importance of four things in the composition and arrangement of music: repetition, silence, changes in volume, and timbre. Twelve predefined sounds can be arranged, and their duration, timbre, and volume can be changed. The user composes a piece by dragging any of the available sounds from a palette onto a staff. The vertical position of the sound determines its timbre, the width of the sound determines its duration, and its height determines its volume. Any sound may be changed in any of these parameters at any time, and cut-and-paste editing is also available. The piece may be played on the Macintosh system's built-in speaker or saved to disk for later retrieval. The score may be printed on an ImageWriter printer. Version 2.0 has all the help present in the application file (no separate file), and a startup screen.

Current status: Version 2.0 is available.
Contact: Kinko's ACE 800-235-6919; in California, 800-292-6640

Music

Mozart

Mozart is used in introductory music composition courses. It is intended to give the music student with no formal experience in composition the opportunity to experiment with musical arrangement, tempo, articulation, and dynamics. It allows the user to compose a minuet from any of six predefined two-measure phrases written by Mozart. The minuet may be up to eight phrases long. The user controls the arrangement of the phrases, as well as tempo, articulation, and dynamics, by dragging items from any of four palettes onto a staff. The minuet may be played on the Macintosh system's built-in speaker or saved to disk to be retrieved later. The staff may be printed on an ImageWriter printer. Version 2.0 has all the help present in the application file (no separate file), and a startup screen.

Current status: Version 2.0 is available.
Contact: Kinko's ACE 800-235-6919; in California, 800-292-6640

Philosophy

Venn

Venn is used for teaching syllogisms and Venn diagrams in introductory philosophy courses. It allows the student who knows about syllogisms to practice solving them by using Venn diagrams. It offers:

- Practice with Venn diagrams on single logical sentences.
- Use of Venn diagrams on single-sentence inferences.
- Use on full syllogisms (two premises and an inference).

Venn randomly makes up syllogisms and shows them; the student represents the premises with a Venn diagram, using MacPaint-like filling of regions with patterns. The program checks the diagram, and the student indicates whether he or she believes the syllogism to be valid or invalid. The program tells the student whether he or she is correct. Version 2.0 has Help files, defaults to Sentence mode, and has other more minor changes. Version 2.1 fixes a bug (introduced by the new Macintosh ROM) in the ordering of the Help menu.

Current status: Version 2.1 is available.
Contact: Kinko's ACE 800-235-6919; or in California, 800-292-6640

DAFRAC

DAFRAC is essentially a tool for the investigation of wave diffraction and two-dimensional Fourier transforms. It is designed to give immediate access to—and some intuition for—the following:

- The Fresnel diffraction patterns for any object
- The difference between the Fresnel and far-field diffraction patterns (and the transition from one to the other)
- The results of two-dimensional Fourier transforms.

Wave propagation is modeled by using either the Fresnel or far-field (Fraunhofer) diffraction integrals, which are evaluated numerically by making use of the Fast Fourier Transform. The resolution at the object is limited to no more than 128 x 128 pixels (in which case, each FFT takes significantly less than a minute). Objects are created in a MacPaint-like fashion, and the resulting intensity maps are displayed as five-level gray-scale plots with user control over the "exposure." The program is well suited both for in-class demonstrations and as a special-purpose calculator for students to use on assignments.

Current status: DAFRAC is available through the Fall 1987 *Academic Courseware Exchange Catalog* distributed by Kinko's.
Contact: Professor Greg Forbes, Institute of Optics, University of Rochester, Rochester, NY 14627

MacAcq

This series of labs and lectures is designed to introduce the student to the general techniques and methodology of measurements used in science. It was originally conceived for freshmen science and engineering majors, but has evolved into a junior-level lab.

MacAcq is a system of software packages designed to perform data acquisition over an RS-232/422 serial link. This link is connected to a controller (the BenchTop Board from MetaResearch). The controller receives commands from the Macintosh via the link, and then sends a continuous stream of measurement data back to the Macintosh. The controller board is interfaced to standard NIM ADC modules. The data acquisition package receives this data, buffers it, and plots it on the display screen for inspection by the user (student). The user may then choose to print a hard copy of the display, file the data for later use, or call the statistical analysis package (currently under development) to try fitting curves to the data. MacAcq allows the data to be viewed in either multichannel or stripchart mode.

Physics

MacAcq cont.

The experiments include counting statistics, random processes, competing models of local gravitational acceleration, charge on the electron, pulse-height analysis, fast time measurements, signals in noise, annihilation of matter, forced harmonic oscillator, Fourier analysis, and feedback in measurement.

Current status: Beta testing.
Contact: Mark Semans, Physics Department, University of Rochester, Rochester, NY 14627

Computer Simulation

An Introduction to Computer Simulation: Applications to Physical Systems, a new textbook by Harvey Gould and Jan Tobochnik has been published by Addison-Wesley. The book is designed for an intermediate course on computer simulation but can also be used as a supplement to an introductory course in physics, and courses on mechanics, statistical physics, waves, electricity and magnetism, quantum mechanics, and physical chemistry. Each chapter has a brief summary of the important physics and algorithms, lists programs in True BASIC, and contains problems that require student modifications of the programs. A double-sided disk with listings of the True BASIC programs and translations of many of them into FORTRAN and Macintosh Pascal is also available. Future projects include modification of the programs to make them more suitable for lecture demonstrations. We are also planning to write additional software for a new introductory physics course at Clark University and Kalamazoo College.

Current status: Textbook and disk complete and available from Addison-Wesley. Some programs for lecture demonstrations will be available by fall 1987.
Contact: Harvey Gould, Clark University, Department of Physics, Worcester, MA 01610; (617) 793-7485 or Jan Tobochnik, Kalamazoo College, Department of Physics, Kalamazoo, MI 49007; (616) 383-8451

Models in International Relations: Colombia University

Artificial Intelligence-Based Models in International Relations is a project under way at Columbia University using the Macintosh. Funded by the Ford Foundation, it involves building models of several international and development-based problems including debt, hunger, and foreign aid. These educational models, when completed, will be appropriate for use in undergraduate classes in development, international relations, international political economy, and foreign policy.

The models will allow the user to learn about a number of substantive problems and to attempt various problem-solving strategies. Users will initially choose a specific issue/area (debt, food policy, foreign aid) and a specific country (the United States, Egypt, Jamaica, Kenya, Nigeria). The user will have the opportunity to test his/her ideas and hypotheses about these issues by playing the role of one of the relevant actors involved in the simulation. While the user attempts various problem-solving strategies, the computer will play the role of the other relevant actors. The user will be able to examine the assumptions and theoretical frameworks of all of the relevant actors involved in an issue/area (for example, for the debt module: Congress, the commercial banks, the World Bank, and IMF), and the causal reasoning that has led to a change in the simulation. The user will have constant access to an extensive bibliography on each topic. Perhaps most importantly, he/she will be able to see how different actors within and across nations perceive the same problems and develop different solutions to these problems.

Current status: Ongoing.
Contact: Margee Ensign, Assistant Professor, School of International and Public Affairs, Columbia University, New York, NY 10027

Sociology

SocStat

SocStat is a sociology statistics laboratory on a Macintosh. It uses studies prepared from actual sociological surveys and allows the student to do elementary statistical analyses on them. Each study consists of up to 16,000 observations on up to 10 variables; each variable may have any of several values (responses by the subjects of the survey). The student can select a study and perform any number of analyses on it: absolute or relative frequency tabulations, cross-tabulations (with dependent, independent and possible control variables), Yule's Q and Gamma tests, and chi-square tests. The results of each analysis appear in a window. Many windows can be created. Any window can be printed and handed in to the instructor as homework. New studies can be quickly created using the companion program SocStudy (see description elsewhere). Version 2.0 has many significant changes. The user interface is far simpler and more modeless; the menus are simpler; the program handles larger studies and is much faster; studies are easily created with SocStudy and are smaller; it is HFS and 128K ROM compatible; there is complete Help text; and a new "Change to..." feature allows easy modification of existing analyses.

Current status: Version 2.0 is available.
Contact: Kinko's ACE 800-235-6919; in California, 800-292-6640

SocStudy

SocStudy allows an instructor to edit old or create new studies for SocStat. For new studies, the instructor must first create on the Macintosh a set of number files that contain the responses, one column of ASCII numbers per file. SocStudy reads those files and accepts other input in modeless dialogs (one per variable plus one per study), and creates a new study in SocStat's binary format. Existing studies can be opened and edited in the same manner. The instructor can extract the responses from existing SocStat studies and put them into a file of numbers. Old studies are displayed in their entirety; any part can be changed, and new data can be read in.

Current status: Version 0.9 is available.
Contact: Kinko's ACE 800-235-6919; in California, 800-292-6640

Telecommunications

Async AppleTalk

Async AppleTalk is a replacement for the standard AppleTalk driver. It allows a Macintosh to access AppleTalk resources across an asynchronous (RS-232) link, even on a dial-up telephone line. If you are using a telephone link, Async AppleTalk will dial the number you specify before starting communications. Most applications work with Async AppleTalk: we have tested file servers (including AppleShare), printing to LaserWriters, electronic mail, our terminal program, DarTerminal, and several public domain AppleTalk utilities and games. Async AppleTalk has been in regular use on the Kiewit Network at Dartmouth College for over a year; approximately 1,800 RS-232 ports use this facility. Several commercial companies have announced Async AppleTalk servers.

This version of Async AppleTalk precludes the use of standard AppleTalk; in other words, you can use standard AppleTalk or Async AppleTalk, but never both together. New work from Apple Computer may allow this in the future, but no schedule for such a feature has been set. Async AppleTalk requires a Macintosh computer with at least 512K of memory; the ROM upgrade is not required.

The desk accessory, a protocol specification for Async AppleTalk, our distribution policy, certain source files, information about creating new dialing procedures, and other documentation is available.

Current status: Async AppleTalk 2.1 is complete.
Contact: Software Librarian, Dartmouth College, Kiewit Computer Center, Hanover, NH 03755; (603) 646-2643

DarTerminal

DarTerminal is a terminal emulation program that connects to host computers through an AppleTalk network. It offers multiple simultaneous sessions, with cut-and-paste transfer between windows. In addition to VT100 emulation and TEK10 graphics, it acts as a distributed screen editor, called MacAvatar, which gives a uniform Macintosh-style editing interface to all our host computers. The Macintosh caches the file locally to give quick response, yet only sends change information to the host to minimize overhead on the host.

Telecommunications

DarTerminal cont.

The MacAvatar communicates with an editor on the host computers. This backend, called Redact, now runs on our VAX/VMS, UNIX, and DCTS hosts; we are currently porting it to our VM/CMS mainframe.

Source code for DarTerminal and Redact is available. DarTerminal is written in MPW Pascal; versions of Redact are available in C or PL/1. The same C source code runs in the VAX/VMS and UNIX (and soon, the VM/CMS) environments, using conditional compilation.

Current status: DarTerminal 3.2 and Redact for VAX/VMS and UNIX are complete; Redact for VM/CMS is under development.
Contact: Software Librarian, Dartmouth College, Kiewit Computer Center, Hanover, NH 03755; (603) 646-2643

Mac3270 at Brown University

Mac3270 is an emulation program that allows a Macintosh to connect to an IBM mainframe as a 3270-family display terminal. With Mac3270, access to full screen applications on the mainframe is simplified by using features of the standard Macintosh interface. For example, a user may position the terminal's cursor using the mouse, or select from a menu to generate a function key. The connection between Mac3270 and the mainframe is made via an AppleTalk gateway. This network connection allows Mac3270 to provide a response time comparable to that of a locally attached 3270 terminal, as well as high-speed file transfer.

Because Mac3270's emulation is done entirely on the Macintosh, Mac3270 can take full advantage of the Macintosh user interface to create an easy-to-use terminal display. Major features in the current version of Mac3270 include:

- All standard 3278 display and keyboard functions are provided, including the complete EBCDIC character set and status symbols on the 25th line. In addi tion, the APL character set and extended highlighting are supported.
- A Function Keys menu is provided so that the mouse may be used to select function keys and other frequently used keyboard functions.
- The 3270 cursor may be positioned using a single click of the mouse. A double-click may be used to generate a user-selected function key.
- Blanks and nulls in 3270 fields are processed using an improved algorithm that corresponds more closely to what most users expect than the 3270 standard. (Standard processing is available as an option.)

Mac3270 at Brown University cont.

- Full support for Switcher is provided. Mac3270 may be run with other applications, or more than one copy of Mac3270 may be run simultaneously for multiple-terminal sessions.

- Mac3270 supports graphics by emulating the essential features of a 3179 G terminal.

- When the host is an IBM VM/CMS system, Mac3270 supports file transfer in both text and binary modes at approximately 3,000 characters per second. File transfer may continue while Mac3270 runs in the background under Switcher.

A new version under development for the Macintosh II will also support color for both text and graphics, as well as different font and screen sizes.

Current status: Ongoing.
Contact: Peter DiCamillo, Brown University Computer Center, Box 1885, Providence, RI 02912; (401) 863-2221

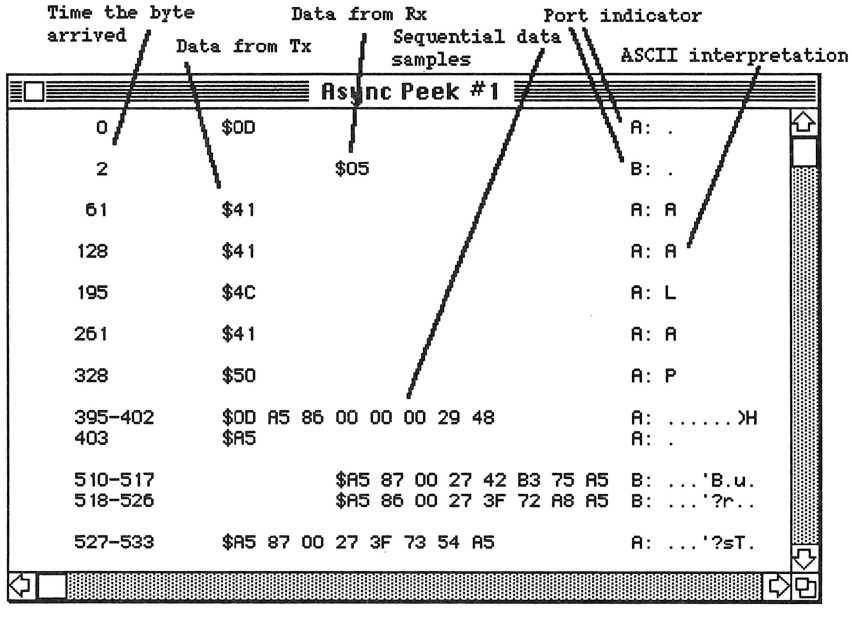
Async Peek

Async Peek is a debugging tool that samples data from both sides of an async (RS-232) link, and saves the data characters and their arrival time. When sampling stops, the characters are displayed in a scrollable window. A special cable taps into the link being debugged to bring the Transmit data to one port, and the Receive data to the other port on a Macintosh.

When you start sampling, Async Peek continuously checks both the A and B ports. If a character arrives on one of the ports, the data byte and its arrival time (in milliseconds) are recorded in a buffer for the frontmost window. When you click the mouse, sampling stops, and Async Peek displays the data.

Async Peek cont.

The display consists of lines that show the time the character arrived (in milliseconds from the start of sampling), the (hex) data byte, and an ASCII interpretation of the byte. The hex data for the B port is offset 10 spaces to the right (see figure below). You can select baud rates of 300, 1200, 2400, 9600, or 19,200. Independent windows (up to four) display data from separate sample runs. Various menu choices allow you to change the formatting of the data displayed in the window.



Async Peek was written in Lightspeed Pascal and MDS assembler; sources are available.

Current status: Async Peek 1.0 is complete.
Contact: Software Librarian, Dartmouth College, Kiewit Computer Center, Hanover, NH 03755; (603) 646-2643

Writing

Learn

Learn contains a series of drills and exercises on subjects ranging from punctuation, grammar, and usage, to paragraphing and outlines. The program uses a text file "script" to produce series of drills on the topic chosen by the student upon entry into the program. Using the script, the Learn program puts up a known bad sentence and, after editing by the student, is checked against a correct answer.

This is a port of a program that is running on the IBM PC. We do not intend to add the friendly Macintosh interface to the program.

Current status: Being ported.
Contact: Tim D'Ascoli, Computing Center, University of Rochester, Rochester, NY 14627

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